SCIENTIFIC AMERICAN

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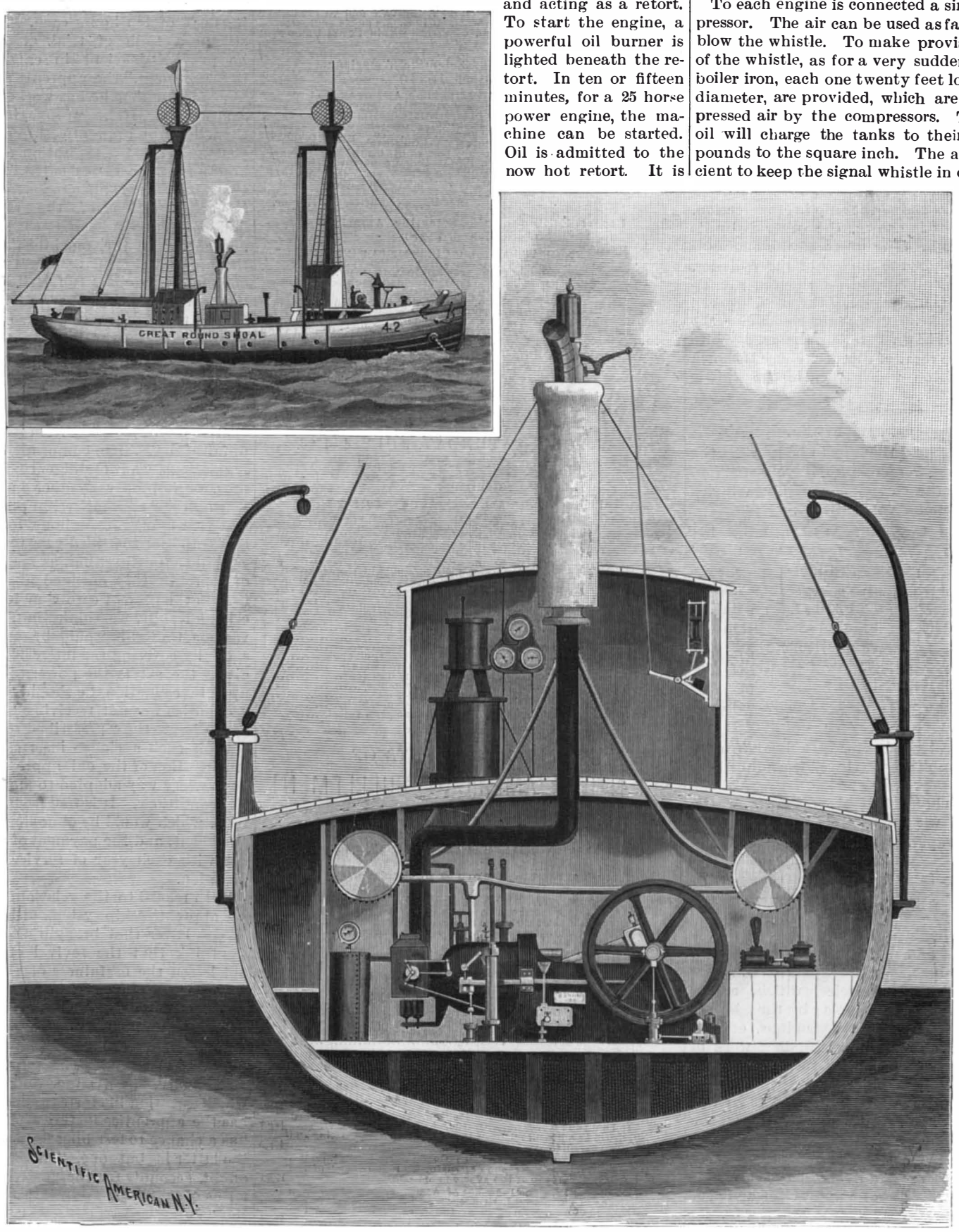
OIL ENGINE SIGNALING PLANT ON UNITED STATES LIGHTSHIP NO. 42.

The United States Lighthouse Board have just completed a signaling plant upon their lightship No. 42, which, when on her station, lies in Vineyard Sound, off Cape Cod. The installation is the second of the kind, and is in many respects novel, and an advance upon anything hitherto accomplished in that line. The duties of a lightship such as No. 42 are twofold, as both visual and auditory signals are to be maintained. The first or visual signals are provided by gratings at her mastheads in the daytime, and at night by fixed white lights, each consisting of a circle of lamps placed in a large reflecting lantern, which are hoisted up to the mastheads every evening. The audible signals may take the form of a bell or of some type of steam or air whistle. On the ship we now speak of a powerful compressed air whistle is employed, and oil engines are provided to compress the air.

Hitherto it has been the custom to have the whistle on this lightship blown by steam. This necessitated the use of coal, which involved much expense and trouble. Often great delay would be experienced in the transfer of coal from the tender to the lightship. An efficiency exceeding four or five pounds of coal to the horse power hour could not well be looked for. If a fog was seen approaching or forming, the boilers would have to be fired in anticipation, and before they were well started the fog might cease. This and similar conditions of the service involved in the course of a year many hours of idle steaming and many tons waste of coal.

The new plant with oil engines avoids to a great extent these troubles. The consumption of oil per horse power hour is only one pound. To the great economy directly due to this fact is superadded the feature that no idle steaming is needed. The engine can be started in fifteen minutes, and the oil consumption ceases the instant the engine stops. A quantity of oil very much less than the weight of coal requisite for corresponding service is required.

The plant is a development of one already in successful use on another United States lightship. In the hull of the vessel are installed two 25 horse power Hornsby-Akroyd oil engines. These are explosion compression engines whose most distinctive peculiarity is the method of ignition of the charge. Back of the cylinder is a vessel forming a sort of continuation of it and acting as a retort. To start the engine, a powerful oil burner is lighted beneath the retort. In ten or fifteen minutes, for a 25 horse power engine, the machine can be started. Oil is admitted to the now hot retort. It is at once vaporized, mixes with the air, and, as the engine is started, explodes, giving an impulse to the piston. The regular cycle of the compression gas engine is followed. The retort keeps hot by the heat of the explosions, the lamps being only used to start the engine, and it may even rise to redness; its direct heat effects the ignition. There is no battery and spark coil and no troublesome ignition tube. It is calculated that 15 horse power can be developed for twelve cents an hour. This power is that approved of by the engineers for lightship signaling.



The Lightship at Anchor. Cross Section Showing Distribution of Machinery.

OIL ENGINE SIGNALING PLANT ON UNITED STATES LIGHTSHIP NO. 42.

The cooling of the cylinder of the engine while running is effected in the usual way by water caused to circulate around it through passages in the metal. Fresh water is employed, as the danger of salt deposits precludes the use of sea water. To avoid waste, the same water is used over and over again, being cooled by a surface condenser supplied with a constantly changing supply of sea water.

To each engine is connected a single acting air compressor. The air can be used as fast as compressed to blow the whistle. To make provision for instant use of the whistle, as for a very sudden fog, two tanks of boiler iron, each one twenty feet long and three feet in diameter, are provided, which are charged with compressed air by the compressors. Ten cents' worth of oil will charge the tanks to their full capacity at 60 pounds to the square inch. The air contained is sufficient to keep the signal whistle in operation for twenty minutes. This period gives ample time to start the engine, so there should never be any delay in getting the whistle in operation.

The expansion of compressed air produces a lowering of temperature, which reduces the volume of the air. As the work done depends on the volume, the diminishing of it involves a loss in efficiency. The whistle, which is of the bell type, and which is placed about amidship over a deckhouse, has beneath it a reheater through which the air must pass. The exhaust from the engine passes through the same reheater, and so raises the temperature of the air and overcomes, to a greater or less extent, the cooling of the air due to its escape from compression. This feature not only is of economical value as utilizing the waste heat of the engine, but it tends to overcome another trouble. It has been found that an air whistle when the temperature fell to 18° F. would become clogged with ice. The heating of the air tends to prevent this. Moreover, the exhaust escapes into the air just forward of the whistle, and will do much to keep it warm and in condition to operate well.

Before reaching the whistle, the air passes through a reducing valve, then through the reheater and then through the whistle valve. The latter regulates the admission of air so as to produce the characteristic signal, and is operated by clockwork. The latter operates a small valve which admits air into a cylinder with piston, which opens the whistle valve. When released by the clockwork, it falls and closes the whistle valve. The clock carries a cam which, by its shape, produces the

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desired order of opening and closing the valve so as to give the signal. The officially designated fog signal for this ship has been a 12 inch steam whistle, with blasts of five seconds duration, followed by fifty-five seconds of silence. The air whistle is slightly modified, its annular opening for the escape of air being smaller than in the case of the steam whistle.

The engines' air compressors and storage tanks are exact duplicates of each other and are interconnected so as to allow the fullest possible degree of interconnection. It is quite improbable that any total breakdown should occur. The oil is stowed away as received in five gallon cans. The engine supply is taken from a tank below the engines, into which the cans are emptied by hand. The air does the auxiliary work of operating the bilge pump, and it may eventually be utilized to operate a power windlass.

The plant was built by the De la Vergne Refrigerating Machine Company at their works in One Hundred and Thirty-eighth Street, on the East River, in this city. The work was superintended by Mr. Wilfrid Sylven, superintending engineer United States lighthouse service. Our thanks are due to him and to Mr. George Richmond, of the De la Vergne Company, for courtesies extended in connection with this subject.

The plant is the second of its kind in the world and is in advance in every way on its predecessor, especially in power. The working unit in the new ship is taken at 15 horse power, in place of 3½ horse power in the first one.

One illustration shows the ship at anchor. The whistle is seen projecting from the reheater above the deckhouse. The other view shows the ship in cross section. One of the gas engines is shown, the other is by its side and parallel with it. The retort of the engine is cased within a hood shown to the left of the cylinder, and beneath it are the oil burners for starting it. To right and left, near the under side of the deck, are seen the compressed air tanks. Rising from the engine, the large exhaust pipe is shown entering the reheater to warm the air. On the right of the deckhouse is shown the cylinder and piston which operate the whistle valve.

An Ingenious Comparison.

Dr. Arnott has compared the human body with the steam engine, and the resemblance is very striking. Below is a copy of the comparison, as given in his "Treatise on Warmth and Ventilation":

THE STEAM ENGINE IN ACTION TAKES:	THE ANIMAL BODY IN LIFE TAKES:
1. Fuel -- viz., coal and wood, both being old or dry vegetable matter, and both combustible.	1. Food — viz., recent or fresh vegetable matter and flesh, both being of kindred composition and combustible.
2. Water.	2. Drink (essentially water).
3. Air.	3. Breath (common air).
AND PRODUCES:	AND PRODUCES:
4. Steady boiling heat of 212° by quick combustion.	4. Steady animal heat of 98° by slow combustion.
5. Smoke from the chimney or air loaded with carbonic acid and vapor.	5. Foul breath from the windpipe, or air loaded with carbonic acid and vapor.
6. Ashes, part of the fuel which does not burn.	6. Animal refuse, part of the food which does not burn.
7. Motive force of simple alternative push and pull in the piston, which, acting through levers, joints, bands, etc., does work of endless variety.	7. Motive force of simple alternate contraction and expansion in the muscles, which, acting through the levers, joints, tendons, etc., of the limbs, does work of endless variety.
8. A deficiency of fuel, water or air first disturbs and then stops the motion.	8. A deficiency of food, drink or breath first disturbs and then stops the motion and the life.
9. Local hurt from violence in a machine is repaired by the maker.	9. Local hurt or disease in a living body is repaired or cured by the action of internal vital power.

Eggs in Therapeutics.

A mustard plaster made with the white of an egg will not leave a blister.

A raw egg taken immediately will carry down a fish bone that cannot be got up from the throat.

The white skin that lines the shell of an egg is a useful application for a boil.

White of egg beaten with loaf sugar and lemon relieves hoarseness—a teaspoonful taken once every hour.

An egg added to the morning cup of coffee makes a good tonic.

A raw egg with the yolk unbroken taken in a glass of wine is beneficial for convalescents.—Medical Record.

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THE APPRENTICESHIP SYSTEM UNDER MODERN CONDITIONS.

On another page will be found a timely letter from a correspondent of Providence, Rhode Island, relative to the decadence of the apprenticeship system, of which subject we spoke editorially in our issue of May 23, and we are certainly "pleased to learn that the old system"--or, more strictly speaking, a judicious modification of it—"is still common in Providence," and that "apprentices are taken by almost every important machine shop and foundry" in that city.

Limitations of space prevent our giving more than an outline of the "terms of apprenticeship" of the Brown & Sharpe Company; but they appear to be just and reasonable, a conclusion which is warranted by the large number of boys (eighty-one) now serving in the shops, and by the fact that many former apprentices have remained after their apprenticeship had expired, and risen to become "foremen and heads of departments." Briefly stated, the "terms" are as follows: The apprenticeship lasts three years, each of which consists of two hundred and ninety-five working days of ten hours each. The first forty days constitute a term of trial, at the close of which, if he prove "deficient in capacity or unsatisfactory in deportment," the apprentice is paid four cents an hour for the time he has worked, and the contract becomes void. If he "prove industrious and of good capacity," the apprenticeship continues for the three years. Before the expiration of the time of trial the apprentice must "execute, together with some responsible surety, an agreement," by which the firm, in consideration of the sum of one hundred dollars, pledges itself "to faithfully instruct the apprentice in the machinist's art and trade." If the apprentice violate the terms of the contract, one hundred dollars is forfeited; but if the apprentice complies with the provisions of the contract for the three years, the sum of one hundred dollars is returned by the firm to the surety in consideration of the "faithful service on the part of said apprentice." The "terms" conclude with the statement that "the company reserves to itself the right in its sole discretion to terminate the agreement and discharge an apprentice from further service for any unfaithfulness, non-conformity with such rules and regulations, want of diligence, indifference to his business, or improper conduct in or out of the shop." During their apprenticeship the boys are paid for the first year four cents an hour, for the second year seven cents, and for the third year ten cents an hour.

While admitting that, as far as they go, the terms of apprenticeship outlined above are admirable, and that in the present case they have certainly given excellent results, we think that, for general use in the various trades, it would be advisable to add a clause specially covering the interests of the apprentice, and giving the surety the power to annul the contract, if, upon investigation, he should be convinced that the apprentice was not receiving "thorough instruction" according to the "prescribed routine."

With such a clause inserted, we think that this modification of the old apprenticeship system would be in every way adapted to modern industrial and social conditions. It is free from the old flavor of servitude, which would be obnoxious to modern ideas and sentiment, and the payment of a weekly wage, increasing with each year of service, is a step in the right direction.

With regard to the relation of the trade school to the apprenticeship system, although it was the decline of the latter that brought the schools into existence, we think that the revival of apprenticeship would not lessen the usefulness of the schools. They both have the same end in view—the systematic training of the mechanic and the abolition from the trades of the "botch" workmen. Each system of training has its strong points in which the other is relatively weak. The pupil in the trade school, for instance, has a larger opportunity to discover in which direction his tastes and aptitudes really lie than has the apprentice in the machine shop. The former has a chance to test himself in several different trades, the latter in but one. This fact to some degree, no doubt, accounts for the forty days' trial clause in the terms of apprenticeship. It frequently happens that the "fancy" of a boy for some particular trade is quickly killed when he makes its acquaintance; and many of the most successful men of our day have, in their early days, tried their hands at various trades before they fell into the particular line of work for which they were qualified by nature.

On the other hand, one cannot too strongly indorse the opinion of our correspondent that the apprenticeship system turns out a better practical mechanic than the trade school, for the reason that "greater skill is obtained under the system which gives the greater number of hours to actual shop practice, especially in the trade of a machinist." It is for this reason that the two systems should be regarded as complementary to one another: the school serving to direct the boy into his proper trade, and furnishing him with the rudiments of its theory and practice; the subsequent

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apprenticeship in the shops giving him the speed, execution and broader knowledge which qualify him to pass as a skilled workman.

THE GEOLOGICAL SOCIETY OF AMERICA.

The announcement of the eighth summer meeting of the Geological Society of America has just appeared, and it shows a radical change from the policy of the society heretofore. The usual plan has been to hold the sessions of its summer meeting during the two or three days immediately preceding the annual convention of the American Association for the Advancement of Science. The effect of this has been to draw away from "Section E" of the association many valuable papers which would otherwise have been presented there, thus reducing the number of papers to be delivered in Section E, until last year and year before there were not enough to make more than half a programme, while the society's time was fully taken up. Not wishing to be a detriment to the parent association, the Geological Society has decided this summer to throw the reading of all its papers into Section E's programme and to devote the week from August 17 to 22 inclusive, preceding the meeting of general association at Buffalo, to a study of the geology of New York State, in four parties, under the guidance of able directors.

The first party will be conducted by Prof. Charles S. Prosser, of Union College, Schenectady, and will devote its attention particularly to the stratigraphy and paleontology of a section across the strata of the central part of the State. The party will spend the first day (August 17) in the vicinity of Syracuse and then proceed to Rochester, where a four days study of the Genesee Valley will be begun, which will include the inspection of typical exposures of all the strata from the Medina sandstone, at the base of the Upper Silurian era, in the ravine below the Lower Fall at Rochester, to the Chemung beds at the top of the Devonian era, near Portageville. Saturday will be spent in going to Buffalo, stopping en route at several places of geological interest.

The second party will give its time to pleistocene geology, under the leadership of Prof. H. L. Fairchild, of Rochester, and Mr. Frank Leverett, of the United States Geological Survey. The first three days will be spent in studying the phenomena of the glacial lake Iroquois and other beaches, kames, etc., in and near Rochester; the beaches of Lake Warren (also glacial) and the enormous glacial hills near Victor, Miller's Corners and Avon, and the glacial remains of the Genesee Valley, Kishawa Gorge and Nunda Valley. The last three days of the week will be devoted to the raised beach phenomena of the glacial lakes Warren and Iroquois, near Alden, Akron, Medina and other places in the western part of the State.

Persons interested in petrography will take the excursions to be conducted by Prof. J. F. Kemp, of Columbia University, New York City, and Prof. C. H. Smyth, of Hamilton College, Clinton. During the first three days of the week the former will take the party, beginning with a day in the vicinity of Port Henry, spending Tuesday in a trip to Plattsburg, with stops at several points of interest on the way, and using Wednesday for getting across the northern Adirondacks to Lake Placid, whence the party will go by rail to Gouverneur. The last three days of the week will be spent in the district about this famous mineral locality under the guidance of Prof. Smyth, who will show the party the relations of the granites and gneisses there to each other and to the crystalline limestones, as well as other phenomena of interest.

The fourth party will devote its time to economic geology, with Dr. F. J. H. Merrill, of Albany, as conductor. The party will first examine the salt works near Syracuse, and the Solvay Process Company's plant, and the next day go to Le Roy and to Lehigh to see the salt mine. A day will be devoted to the gypsum mines at Garbutt, another to the extensive quarries of Medina sandstone at Albion and Medina, and a third to the marble quarries at Lockport. Saturday will be given up to visiting the hydraulic cement quarries and works in Buffalo and the brick and tile works at Angola.

The formal summer meeting of the society will then be held Saturday evening, August 22, at which administrative business will be transacted and papers will be read by title only. The excursions which have been described are freely open, not only to fellows of the Geological Society and all members of the American Association, but also to any persons, men or women, who desire to take advantage of them. No fee is required, and the only expenses are those for transportation and subsistence. Persons desiring to join any one of these parties should notify the conductor of it at the earliest possible date. Further information regarding the excursions may be obtained by writing to any of the gentlemen named.

DR. NATHANIEL L. BRITTON, Professor of Botany at Columbia College, has been appointed director of the new Botanical Garden which is to be established in Bronx Park, New York City.

Scientific Meetings to be Held at Buffalo.

BY H. C. HOVEY.

Owing to the asperities of war, the American Association for the Advancement of Science was in a state of suspended animation for five years; from which it was happily revived in 1866, by the activity of the citizens of Buffalo, who invited it to meet in that place in the year mentioned. In recognition of this kindly service the association has met there with the return of each decade since that date, and will meet there this year to hold its forty-fifth anniversary. Several affiliated scientific societies will also avail themselves of the hospitality of Buffalo, preceding and following the sessions of the parent society. The official time thus occupied will be from August 19 to September 2, inclusive.

An important change should be noted as to the time of assembling. Heretofore the custom has been to meet in the middle of the week and hold over till the week ensuing. But it is now thought best for the council to meet on Saturday to perfect its arrangements; and for the first general session of the Association to be on Monday morning, August 24, in the high school chapel. At that time the retiring president, Prof. E. W. Morley, will introduce the president-elect, Prof. E. D. Cope, of Philadelphia. An invocation will be offered by the Right Rev. A. C. Coxe, Bishop of Western New York: the address of welcome will follow, by his Honor Mayor Edgar B. Jewett, to which President Cope will reply. On the adjournment of the general session the nine different sections will organize in their respective halls; and in the afternoon their vice presidents will deliver the annual addresses on various topics suitable to their departments of scientific research. Monday evening President Morley will deliver the public address before the general session, followed by a reception given by the ladies of the city. The way will thus be cleared for four days of solid work; and Tuesday, Wednesday, Thursday and Friday will be entirely devoted to the reading of papers in the sections. Saturday will be given up to excursions, with which the annual meeting of the A. A. A. S. will close.

Another important modification is the new rule requiring all abstracts of papers to be sent to the secretaries of the sections previous to July 1, to enable the publication of a preliminary programme which will be issued in advance of the meetings.

Concerning the affiliated societies it is announced that the Geological Society of America will meet Saturday evening, August 22, in the library building, for administrative business and to prepare a list of the papers to be presented and discussed in the section of geology and geography during the ensuing week. This society has arranged for a number of fine excursions throughout the rock formations of Western New York, to which all members and friends of the A. A. A. S. are invited. The excursions will be under competent conductors, and a descriptive circular can be had by applying to the secretary, Prof. H. L. Fairchild, Rochester, New York. The study of Niagara Gorge and its related features will be left until the close of the association meeting, and will be conducted by Prof. G. K. Gilbert, of the United States Geological Survey, and will require two or three days.

The American Chemical Society will meet in the high school building, August 21 and 22. The Society for the Promotion of Agricultural Science, the Association of Economic Entomologists, the Botanical Society of America, will all meet at the same date as above. The Society for the Promotion of Engineering Education will meet in the library building, August 20, 21, and 22. And the American Mathematical Society will meet in the lecture hall of the Society of Natural Sciences, on August 31 and September 1.

The grand excursion of the A. A. A. S. will be to Niagara Falls, on Saturday, August 29, and will give the members an opportunity to see what has been done by the investment of many million dollars in opening the wonders of the great cataract and its environs for enjoyment and sightseeing, as well as harnessing its gigantic energy for utilitarian purposes.

The local secretary, Prof. Eben P. Dorr, of the Buffalo Society of Natural Sciences, will give any additional information desired, as to railroad rates, hotel accommodations, entertainments and excursions. Every effort will be put forth to make this one of the most delightful meetings ever held by the scientists of America.

The Kelvin Jubilee.

The Kelvin jubilee began June 15 with a conversazione in one of the buildings of Glasgow University. About 2,500 persons were present. Telegraphic congratulations were received from all over the world. On June 16 Lord Kelvin was presented with addresses from various universities of the world by representatives from these institutions of learning. In the evening the municipal banquet was held. The university conferred honorary degrees on MM. Mascart and Lippman and on Profs. Newcomb and Cleveland Abbe.

The Second Volume of the Year 1896.

We draw the attention of our readers to the fact that the present issue opens the second volume of the year 1896, and would suggest to those who are readers only that this would be a fitting time to place their names upon our list of subscribers. One of the earliest numbers of the volume (July 25) will be a special semi-centennial issue, commemorating the foundation of the house, which we are sparing neither time nor expense to make one of the best things of its kind published in recent years. It will consist of a review of the progress of the United States during the past fifty years in the leading arts and sciences, with copious illustrations showing the various stages of development. It will also contain the prize essay on the progress of invention during the past fifty years and an illustrated history of the SCIENTIFIC AMERICAN.

We think that such a compendium, showing the world's progress then and now, will prove a valuable mile stone for future reference; and those who place their names upon our list at the present time will be entitled to this number and will be enabled to include it within the early pages of their first volume. The special front page sheet for binding will be furnished with the current issue upon application to the editor.

Sir Joseph Prestwich.

Sir Joseph Prestwich, one of the founders of the modern science of geology, is dead. He was born near London, on March 12, 1812, and was educated in Paris and at University College, London. He was president of the Geological Society in 1870–72 and vice president of the Royal Society in 1870–71. In 1874 the Institution of Civil Engineers gave him a medal for his paper on the construction of a tunnel between England and France. He was appointed professor of geology at Oxford in 1874, and two years later published an exhaustive treatise on the water supply of that city. In 1885 he was elected a corresponding member of the French Academy of Sciences. The first volume of his work on geology was published in the following year. He received many honors from various scientific societies in Europe and the degree of D.C.L. from Oxford, and he was elected president of the International Geological Congress which was held in Paris in 1888. One of his later treatises was written to prove the probability of western Europe having been submerged at the close of the quaternary period, which might have given rise to the tradition of the flood.

Substances Sensitive to Radiant Heat.

Dr. Liesegang gives a list of some of the most important cases of sensitiveness to weak radiations of heat. Paper saturated with cupric bromide or a mixture of sulphate of copper and potassium bromide has a faint greenish tint, which becomes olive brown under radiant heat, and if a wooden fretwork is used as a screen a brown image can be obtained in a minute by exposing to the radiations from a gas stove, and on treatment with silver nitrate this image becomes black by reason of the reduction of the silver. Bichromated paper is affected by radiant heat as by light, and paper impregnated simply with sulphate of copper yields a feeble image, which becomes nearly black when treated with silver nitrate. A mixture of sulphate of copper and oxalic acid gives a paper which becomes brown on exposure, and chlorate of copper is very sensitive to faint blue, becoming deep green. Similarly used, bromide of tin behaves as if exposed to light; the unexposed parts becoming very black when treated with silver nitrate. Nitrate of silver is slightly browned, and the tint is deepened by acid hydroquinone or gallic acid. Nitrate of lead gives a yellow image, which is reddened on treatment with silver nitrate.

African Grass Fires.

In a recent number of Science Progress Mr. Scott-Elliott tells how African grass fires change the aspect of the vegetation of the region. These annual fires prevent the accumulation of leaf mould that would improve the soil. One curious effect of the annual fires is to cause many herbaceous plants to send up bare stems, except for the flowers, often several feet in height, immediately after the first shower of the rainy season, the stems only beginning to bear leaves after the rains have well set in. The flowering time of many trees, shrubs and herbs is entirely changed. Another curious fact is the manner in which certain trees manage to protect themselves against the fires. The most remarkable of these are tree Euphorbias, which come out of the fires with apparently no injury, except, perchance, a few slightly charred branches. Mr. Scott-Elliott procured the barks of several kinds that withstand the fiery ordeal, and an examination of them by Professor Farmer shows that they all have a certain amount of gummy degeneration of the bark cells, together with no inconsiderable amount of sclerotic cells. Professor Farmer concludes that "it seems not impossible that these two facts may be connected with the resistance of the plants to the fire."

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AN ICE VELOCIPEDE.

The accompanying illustration shows the general features of an ice velocipede, constructed on the principle of a bicycle, and adapted to be propelled on ice or snow. It has been patented by Mr. James Edward Leahan, of 92 High Street, Boston, Mass. The steering post is extended down adjacent to the ground, and terminates in a skate, and it is provided with a brake, which is bifurcated at its lower end, and is slidably adjusted on said steering post. By means of a brake lever mounted on the handle bar, the forked end can be pressed against the ice, on each side of the skate. The rim of the driving wheel is provided with a flat tire, fastened to the rim by means of bolts, which have pointed heads projecting on the periphery of the tire, which bite the snow or ice when the wheel is in operation.

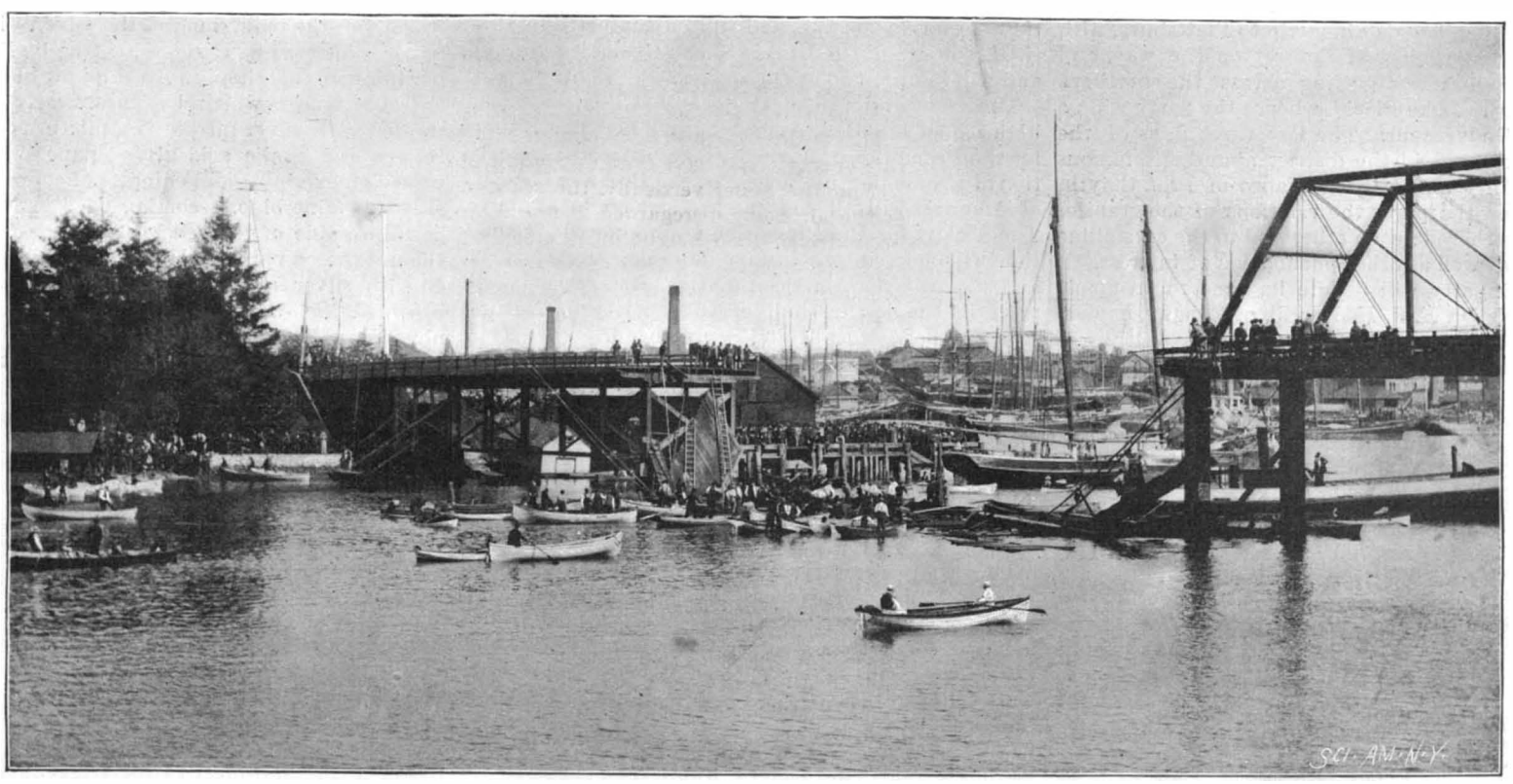
The top bar of the frame is extended to the rear, where it is provided with a downwardly projecting hollow bar, in which a supporting bar is arranged to slide vertically. To the lower end of the supporting bar is fixed a rear skate, and the upper end of the bar is toothed to mesh with a circular rack, which is keyed on the end of a horizontal shaft carried below the top bar of the frame. At the forward end of this shaft is keyed a gear wheel meshing with a segment rack, which is operated by a hand lever conveniently pivoted in front of the saddle and upon the top bar. By operating this lever it will be seen that the rear supporting bar may be raised or lowered as desired. In its normal position the rear skate will be adjusted so that the driving wheel will touch the ice sufficiently for the spiked parts of the wheel to take hold of it; and when it is desired to "coast," the rear skate will be forced down and the driving wheel lifted clear of the ice or snow.

LEAHAN'S ICE VELOCIPEDE.

THE VICTORIA BRIDGE DISASTER.

We present an engraving made from a photograph of the Point Ellice bridge disaster at Victoria, British Columbia. On the afternoon of May 26 a defective span in the Government Street bridge across Victoria Arm gave way, precipitating a loaded street car and several carriages into the bay, a hundred feet below. The bridge was crowded with vehicles containing people who were going to Macauley's Point, where the Queen's birthday celebration sports were in progress. The car had upward of 100 persons on board. When the middle span of the bridge was reached it collapsed, throwing the carriages, the car and some foot passengers into the water beneath. The car was completely submerged, many of those in the inside being drowned. Others were injured by falling timbers. Nearly 200 persons went down with the span. Owing to the holiday, nearly all the craft were away on excursions, so that boats were hard to procure. Steam and naphtha launches were hurried to the scene, and the boats of the warships were active in the work. Scores of people were found floating in the debris, and many were drowned before a rescue could be effected. The sad affair cast a deep gloom over the city and the naval review and sham battle were at once canceled. Thousands of people crowded around the approaches of the bridge, eagerly scanning each of the sixty-three bodies, on the lookout for friends.

A large number of people were injured. The bridge was originally built for wagon traffic, and was evidently not strong enough for the electric car service. The span which broke was 150 feet in length. The water at this point of the branch of Puget Sound is 20 feet deep. The car was finally hauled to the shore, and it was found that it had turned clear over in its fall. This is, without doubt, the worst accident in the history of street railroads. The view shown in our engraving is from a photograph taken by S. J. Thompson, New Brunswick, B. C.



THE VICTORIA BRIDGE DISASTER.

Vitality of Plants in Severe Cold.

"In the polar regions and at great heights," says Der Stein der Weisen, "some plants can endure a very low temperature; at a continuous temperature of —50° C. [—58° F.] are found a large number of cryptogams, fungi, mosses, lichens, and even some conifers, such as pines and junipers. These plants lead at best a sort of latent life, as they neither respire nor assimilate. Now Jumelle, who has undertaken investigations on the subject, has found that this suspension of vital functions proceeds not directly from the influence of the cold, but from the drying of the plants, and he has tried the effect of cold on cryptogams and conifers that were not dried. He subjected with this intent lichens soaked in water and freshly cut branches of pine to temperatures of —30° to —40° C. [—22° to —40° F.] and investigated the emission of gas both in light and in darkness. In earlier researches it had already been shown that plants below zero [32° F.] ceased to respire, and Jumelle could not find the least evidence of carbonic acid in the atmosphere under —10°. He now confined himself to researches on assimilation. The result was that in the case of the plants that were able to withstand when moist the most intense cold, the decomposition of carbonic acid went on long after respiration had ceased. It was in particular established that the pines, the junipers, and one species of lichen assimilate carbon from the atmosphere in the light, when the temperature had sunk to —35° [—31° F.] and even to —40° [—40° F.]."—Literary Digest.

Vessel Damaged by a Whale.

A strange incident lately occurred in Australian waters. The brigantine Handa Isler arrived at Sydney Harbor from New Zealand, presenting the appearance of having been struck by a heavy sea, as she was much damaged amidships. The vessel had made a fair voyage from Mercury Bay, New Zealand, with a cargo of timber, up to within ten days of Sydney. Two large whales were sighted, each being about 60 feet in length. At first they appeared to be heading across the ship's bows, but they suddenly slewed round and came broadside on to the ship at a tremendous speed. The first whale struck the ship amidships and, although the vessel is 260 tons register and was laden with nearly a million feet of timber, the concussion was so great that the vessel shook from stem to stern. The second whale, fortunately, did not ram the ship, but dived just before reaching the Handa Isler, and passed under the keel. The brigantine was badly damaged by the collision, and the whale must have been terribly injured, as the sea around was speedily dyed with its blood, and the animal did not rise after striking the vessel. The well of the ship was at once sounded, and it was discovered that the water was making at the rate of a foot an hour, which, in a vessel so deeply laden, was a very serious matter, Sydney being 220 miles distant. Examination showed that there was a large dent in the side where the whale's head had butted in the planking and framework. As the water gained on the pumps, the deck cargo was jettisoned, but continuous pumping enabled the crew to finally get the vessel clear. On the next day, the weather being very favorable, a pad composed of green hides, in which pillows had been sewn, was fastened over the dent in the timbers. The inrush of water was then checked, says the Leisure Hour, and the vessel was also enabled to weather the severe gales which followed, and to reach Sydney Harbor in safety.

Origin of the Loving Cup.

The origin of the loving cup is given in this tradition:

As King Henry V, of England, was riding through the forest one day he chanced to come upon a wayside inn, and, being thirsty, called for a drink. A serving maid appeared at the door with a cup of wine which she handed awkwardly to the royal visitor by the single handle, and the king was forced to take it in both his hands, thereby soiling his gloves. When he returned home he determined that such a mishap should not occur again; so he ordered a suitable mug to be made with two handles, which he sent to the inn with instructions that it was to be filled for him when he next called. Happening soon after to be in the neighborhood, he stopped at the inn and called for a drink. What was his chagrin when the same maid appeared grasping in her hands the two handles of the mug, and a second time he was compelled to receive it in this awkward fashion. The next year he ordered another mug to be made for him with three handles, which proved a successful solution of the problem. Thus is said to have originated the loving cup.

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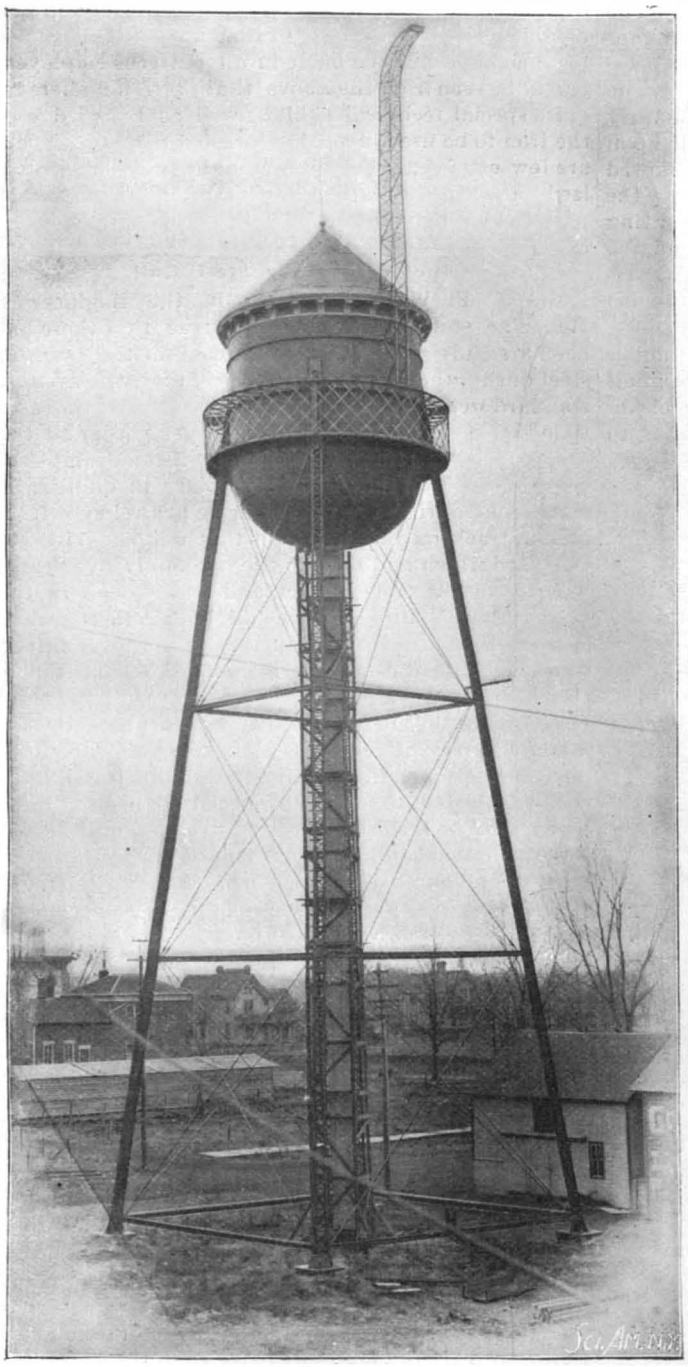
AN IRON WATER TOWER.

We present an illustration of an iron water tower which has recently been erected at Fort Dodge, Iowa, by the Chicago Bridge and Iron Company, of Washington Heights, Chicago, Ill. It is a good example of iron water towers which are in pleasing contrast with the ordinary ugly wooden tank. With a water tower like the present, the tank itself can be placed at such an elevation that the water is supplied at sufficient pressure for a reasonable fire duty. The tower is 116½ feet high from the foundations to the top of the tank. It is surmounted by a mast whose curved upper end supports an electric light at a distance of 147 feet from the ground. The diameter of the tank is 25 feet, and it is provided with a hemispherical bottom, supported at four points by the horizontal girder at the tangent point of the hemisphere.

The cylinder is 20 feet in height, so that the vertical height of the tank is 32½ feet, the capacity of the tank is 104,000 gallons. The tank is supported by four columns, each composed of two 15 inch channels, with horizontal struts of 7 inch channels. The brace rods are respectively 1, 1⅛ and 1¼ inches in diameter. The tower is



AN IRON WATER TOWER.

40 feet square at the foundation. The cornice is of galvanized iron, and the roof is a cone of sheet metal. One objection which has been made to metal tanks is their liability to freezing, but it would seem that this objection was fully counterbalanced by the liability of the wooden tank to leak unless it is kept supplied with water. Tanks of this kind are considered by the makers to be very valuable for fire duty, as the same pressure can be obtained as with a stand pipe, with a smaller cost of maintenance. From an æsthetic point of view the iron tower has certainly marked advantages over the ordinary wooden affair.

The Fossils of the National Museum.

A catalogue of the types and figured specimens of fossil animals in the United States National Museum has been recently completed, says Science, and comprises type material representing 3,644 species, distributed as follows: Invertebrates, Palæozoic, 1,155; Mesozoic, 1,024; Cenozoic, 1,312; Vertebrates, 163. The fossil plants are not yet fully catalogued, but it is known that they represent more than 2,000 species, over 500 of them being contained in the "Lacoe Collection" alone. There are in round numbers 500 Palæozoic and 1,500 Mesozoic and Cenozoic species. Every type or figured specimen is made conspicuous by attaching to it a small, green, diamond shaped ticket, or a white ticket bearing the word type. Should any specimen be separated from its label, this ticket will draw attention to the fact that the specimen is a type and must be cared for.

Some Facts About Boilers.

An exchange says: What a tremendous force is struggling to tear a boiler to atoms! Take, for example, a horizontal tubular boiler of ordinary proportions, 60 inches in diameter by 16 feet long, containing 83 inch tubes. Such a boiler has a surface area of 40,716 square inches. Suppose this boiler is operated with a working pressure of 100 pounds per square inch, which is not at all uncommon. The boiler does, therefore, sustain a total pressure of 4,071,600 pounds, or more than 2,035 tons. Do we realize what this means? The boiler has resting upon it the equivalent of a column of granite 10 feet square, and 254·5 feet high, only 50 feet less than the height of the Statue of Liberty. Put it another way. The boiler is holding up the equivalent weight of 22,620 persons, all robust athletes, football players, each weighing 180 pounds. Let us look at the matter from a slightly different standpoint. The best authorities agree that the ordinary draught horse, working eight hours a day, exerts an average force during that time of 120 pounds. Now, this force acting to disrupt the boiler longitudinally is 226,200 pounds, so that to produce an equivalent stress, it would be necessary to hitch up to each end of the boiler a team of 1,885 horses. Who would drive such a tandem? Has the Jehu yet been found?

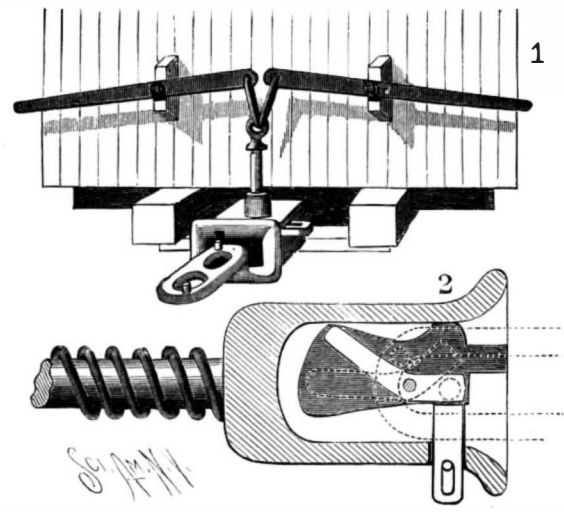
But when we investigate the energy stored up in such a boiler, the facts are still more astounding. Not long since, a boiler having dimensions substantially those of the boiler already referred to, exploded with disastrous results, and as it had been in use but a few years, and was in excellent condition, there was good reason to believe that the bursting pressure did not fall short of 500 pounds. Assuming this to be the case, and that the water level stood at the ordinary height, we find that the water had latent in it in the form of heat the enormous quantity of 299,834,371 foot pounds of energy, while the available energy in the steam is 16,821,499 foot pounds, in comparison with a negligible quantity. When the boiler let go, the heat was transformed into mechanical energy, which was expended in wrecking the plant. The immensity of these figures is beyond our limited comprehension, and the only way by which we can get some idea of their meaning is in making comparisons. How many pounds of gunpowder in exploding would liberate the same energy? The combustion of one pound of average gunpowder generates 250,000 foot pounds of energy. The energy set free, therefore, by the exploding boiler is only rivaled by the explosion of 1,290 pounds of powder.

The boiler weighed 9,000 pounds. If all this energy could have been utilized in projecting the boiler vertically, the resistance of the air being disregarded, it would have been driven to a height of 6⅔ miles, with an initial velocity of 4,760 feet per second, or 54 miles a minute. Our far heralded express trains, of which we boast so much, would be left out of sight. Imagine this energy expended in imparting momentum to a cannon ball weighing one ton and hurled vertically. It would rise 30 miles. Contrast the pressure at which boilers are usually worked with those exerted by great winds. A hurricane blowing at the rate of 100 miles an hour exerts a pressure of 49·2 pounds per square foot, while with steam boilers a working pressure of 100 pounds per square inch, or 14,400 pounds per foot, is considered quite ordinary. Why, then, should we wonder at the awful devastation wrought by a steam boiler explosion!

AUTOMATIC CAR COUPLING.

The automatic car coupling herewith illustrated has been patented by Mr. William Herrick, of Marshall, Minn., and for further information address Mr. Joseph Kent, at the same place.

The hollow coupling head has a recess formed in its upper side, in which is pivoted a horizontally swinging cam whose outer end can swing beneath, and from under, the lower end of the coupling pin hole. The coupling link is flat and has on one side of each end an upwardly extending lug or pin, so placed that when the link enters the coupling head the lug will enter a groove in the under side of the top wall of the head, and bear against the inner arm of the lever, throwing it into the position shown by dotted lines and allowing the pin to drop into locking engagement with the link. The pin is operated by a pair of vertical levers, fulcrumed at the end of the car, one on each side. When it is desired to release the coupling, the pin is raised by said levers and the link drawn out, which latter operation will cause the outer arm of interior lever to be thrown beneath the pin hole, whereby the pin will be held in the proper position

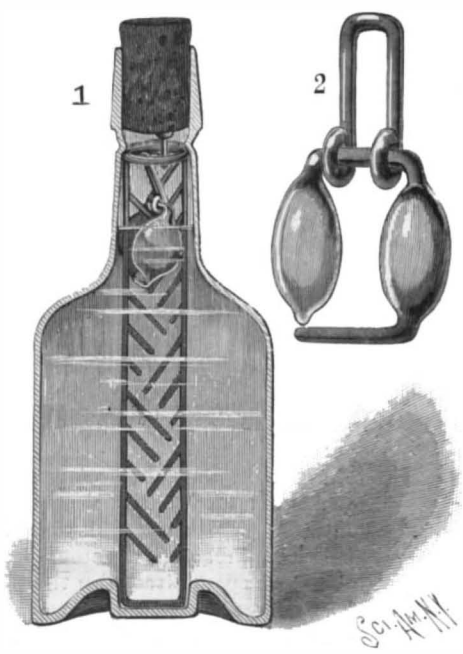


HERRICK'S AUTOMATIC CAR COUPLING.

ready for another coupling. When it is desired to leave the pin in the raised position, the car not being withdrawn, it is done by pushing slightly inward the sliding plate, which is operated through the side of the coupling head.

INDICATING DEVICE FOR BOTTLES.

The device shown in the accompanying illustration, whose object is to indicate with absolute certainty if anything has been added to the primary contents of a bottle or vessel, or if the same has been filled a second time, has been patented by Dr. Johannes Meyer, of 110 Pennsylvania Avenue, Brooklyn, N. Y. The bottle is provided with a floater and a guiding scale, preferably of glass, of the form shown in Figs. 1 and 2. The floater consists of two links, the lower of which is provided with two airtight bulbs, and the guiding scale is a lattice construction, consisting of a top ring to which is attached a long downwardly extending U-shaped strip, the base of which rests in a pit at the bottom of the bottle, the upper ring being held snugly beneath a circular inwardly projecting rim, formed in the neck of the bottle. The guiding scale, which may be made of any material, is provided with a series



MEYER'S INDICATING DEVICE FOR BOTTLES.

of downwardly inclined step bars of variable length, so arranged that a zigzag passageway is left between them from the top to the bottom of the scale. When the bottle is filled, the floater is placed in the scale and lies on the surface of the liquid. As the contents are withdrawn the floater will fall through the scale, and while it will pass easily downward, it will became entangled in the many bars of the scale should an attempt be made to withdraw it, either by pouring in additional liquid, or by shaking the bottle, or by introducing an instrument. It will thus be impossible to remove any of the original contents of the bottle without detection. To prevent the floater from rising to the bottom of the bottle, should it be inverted during shipment, a glass rod is attached to the bottom of the cork, which prevents the floater from entering the scale until the cork is removed. When the bottle is emptied the floater lies doubled up in the pit at the bottom of the bottle.

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Science Notes.

Nature tells of a tale of a pair of rooks, evidently young birds, that strove in vain to build a nest. The wind each time blew the foundations down while the rooks, which fly far for nest materials instead of taking those close at hand, were away. At last, despairing of building a home by legitimate means, they fell upon a completed nest of another pair while the owners were absent, tore it to pieces and built a nest foundation that would stand in the wind. Then they made a superstructure in the clumsy and inexperienced way that young birds always do.

A recent paper in the Comptes Rendus described a self-registering thermometer balance, containing either gas or saturated vapor, by MM. H. Parenty and R. Bricard. The two arms of a balance carry respectively a barometer and an air thermometer, both dipping into the same mercury trough. At constant temperature, and with varying atmospheric pressures, the alterations in the weights of the two arms caused by the movements of the mercury are identical, and the balance remains in equilibrium; but an alteration of temperature causes a motion of the beam, which can easily be made self-registering. For a small range of temperature the sensitiveness of the apparatus is considerably increased by substituting a volatile liquid for the gas. The device also readily acts as a temperature regulator.

Among the current inventions recorded in the scientific papers is that of an instrument by an English inventor for accurately measuring the quantity of light given out by a star, stars being designated as of the first down to the twentieth magnitude, according to the intensity of the light from them. By this new device the rough designation of magnitude is represented by numbers, which give the exact ratio of one star to another in light-giving power; the star Arcturus, for example, being estimated by this means to give seventy-five and three-quarters times the light of Regulus. The amount of light which reaches the earth from the stars varies according to the state of the atmosphere, and it is claimed that this instrument will be of valuable service not only in astronomy, but in meteorology also.

It is a curious coincidence that while the hundredth anniversary of Edward Jenner's first successful vaccination in the little Gloucestershire village where he practiced is being celebrated throughout Europe, the town of Gloucester is suffering from an epidemic of smallpox, which has already cost hundreds of lives and which is due to the town authorities being opposed to vaccination. The dean and faculty of the Medical School of University College, Bristol, having consented to receive and permanently locate the valuable collection of mementos of Edward Jenner, known as the "Jenner Relics," it is desired to raise by public subscription the sum of £1.500 in order to defray the cost of purchase from Mr. Frederick Mockler, of Wotton-under-Edge. Each subscriber of one guinea and upward will receive, when the list is complete, a silver medal, and to subscribers of not less than half a guinea a bronze medal will be presented, commemorative of the Jenner Centenary, May 14, 1896.

At a meeting of the Academy of Natural Sciences of Philadelphia, Prof. Oscar Carter recently gave an account of an interesting discovery made about a mile from Three Tans, Montgomery County, Pennsylvania. In a sandstone quarry at that place an iron tree was found embedded in the rock 10 feet below the surface. The tree is about 18 feet long and 8 inches in diameter. It has been completely turned to iron, or rather to the iron ore known as brown hematite. Prof. Carter accounts for the phenomenon by the fact that the shales and the sandstones in that neighborhood are covered with red oxide of iron, and sometimes with brown hematite. It is presumed that the iron ore was reduced by organic matter, and that it was made soluble in water containing carbonic acid gas. As the water holding the iron in solution came in contact with the tree, the iron was precipitated on the tree, and there was an interchange of vegetable and mineral matter, so that the rocks were relieved of their coloring matter and the tree took it up.

A correspondent of one of the daily papers, says the English Mechanic, calls attention to the condition of the tomb of the famous and illustrious Edmund Halley (1656–1742), known all the world over as the discoverer of the "Halley comet." He lies interred in the old portion of the beautiful churchyard of Lee, near Lewisham, not far from the parish church. Edmund Halley's resting place is marked by a plain massive sarcophagus of gray sandstone, containing a long Latin inscription, which, however, has become so obliterated that it can now scarcely be deciphered. In addition to this, the monument is in several places fast crumbling to pieces, in spite of the fact that the tomb was "Restored by the Lords Commissioners of the Admiralty, March, 1854," as an inscription in front of the monument intimates. "I therefore," he says, "venture to suggest that the time has now arrived for a renewal of the restoration of the great astronomer's grave, so that it should present a decent and worthy appearance for generations yet to come."

AN IMPROVED SIGNAL LANTERN.

The signal lantern shown in the accompanying illustration has been patented by Mr. John T. Casey, of 250 Lafayette Street, Germantown, Philadelphia, Pa. The object of the invention is to provide a lantern which shall contain both a red and a white shade, so arranged that either a white or a red light may be shown as desired, and the change made with greater speed and certainty than is possible with existing lamps.

The lamp consists essentially of a lower body portion, which contains the oil reservoir, the base of the body being flared and perforated for the supply of air. The oil cup is provided with the usual burner, and it carries a ring or casing in which is fixed the base of a white shade of the usual pattern

Around the oil cup is arranged a cylindrical red shade, which is made vertically adjustable about the same. This shade is held in a metal frame consisting of a top and bottom ring connected by vertical strips. The top ring of the frame is provided with small projecting lugs or guide strips which travel in vertical slideways which run from the dome of the lantern down to the outside annular ring which embraces the top of the lower body of the lantern. The red shade frame is provided with a vertical rack for raising and lowering the same, said rack being operated by means of a pinion and wheel attached to the lower body of the lantern. The top edge of the body of the lantern is snugly embraced by a stout ring, upon which are securely fastened a set of outwardly bowed ribs which serve to protect the shades and to carry the top dome. Extending from the dome to the lower ring are vertical slideways which receive the lugs on the red shade frame and serve to guide the same in its vertical movement. The lower ring with the attached ribs, slideways and dome is hinged horizontally to the top edge of the lower body of the lantern and is provided with a suitable latch, so that the upper half of said lantern may be swung open for lighting, cleaning, etc. In operation, if the brakeman desires to

CASEY'S IMPROVED SIGNAL LANTERN.

show a white light, by means of the rack and pinion he lowers the red shade entirely within the lower body of the lantern; if he wishes to show a red light, he raises said shade until it completely incloses the white shade, and fills the space between the body and dome of the lantern, as shown in the above cuts.

In constructing this lantern the inventor has sought to provide: First, a lantern to do the work of two ordinary lanterns; second, to provide a lantern exactly the same in size and shape as the present standard railway lantern; third, to provide a lantern which can be lighted in the severest storm; fourth, to provide a lantern with a burner which will allow the turning up or lowering of the light from the outside without removing the shades or any part of the lantern.

The Shrinkage of Iron.

The action of fluid cast iron in the mould is somewhat curious. When poured into a mould in a state of fluidity, cast iron, and especially what is known technically as "very gray," expands at the moment of solidification, thus giving a sharp impression in the mould. The expansion, slight but very noticeable, extends until in the process of cooling the iron attains the stage of red heat. Contraction then takes place, with the result that the cooled iron is noticeably smaller than the mould. In making patterns for iron castings, therefore, pattern makers commonly allow about one-eighth of an inch per foot for shrinkage. The shrinkage in castings, however, is by no means a constant quality, but varies materially with the proportion existent in the pattern and the character of the metal used—as much as one-tenth of an inch per foot being allowed when casting beams and only one thirty-second of an inch with large cylinders.

When any metal in a fluid state is poured into a cold mould, solidification commences at the outside. As the cooling is continued, the castings, therefore, would consist of a rigid outside envelope containing a soft interior. If, therefore, the condition of a small piece of such metal in the center of a square be considered during cooling, it will be seen that the contracting force existing on each side of the square will be the same. A cube or sphere of cast iron contracts in cooling in a uniform manner throughout its mass. If two squares be placed side by side, forming a rectangle, on each half of the sides, the contracting forces are as before, but on the ends, there being no rigid division between the two squares, both parts exert a unit of contracting force. The result is that the contracting force of the ends is equal to that of the sides, or, on a unit of length, the contracting forces are double as great on the ends as on the sides.

In casting, therefore, thin strips, the shrinkage of the length is very great, while in the thickness it is scarcely appreciable. A square plate shrinks little in thickness, but equally in width and breadth; a flat disk shrinks little in thickness, but equally in all diameters. A thin ring shrinks more in diameter than a thick one, and so on. When it is known that iron with different shrinkage from that generally employed is to be used in a foundry, the patterns are altered to meet the changed conditions. Silicon, unless in excessive quantities, gives a gray, soft iron which has the minimum shrinkage. In many cases a judicious mixture of iron will give the desired result without extra expense in pattern making. Charcoal iron has usually a higher melting point than that of less pure iron made with coke. It sets more quickly in the mould and contracts more, so that an extra allowance for shrinkage must be made in all patterns employed. It will be seen from the above that pattern makers require special technical skill as well as knowledge of the iron to be used in casting for their patterns. There are few employments which require greater specialized knowledge of rather a wide range than that of pattern making.—Invention.

The Life of the Steel Rail.

Mr. J. F. Wallace, writing in the Engineering Magazine, states that while it is true that there has been a steady and uniform decrease in the price of steel during the last quarter of a century, the average standard weight of rail for main lines has at the same time increased from 60 lb. to 99 lb. per yard, and the quality has materially depreciated. As an example of the deterioration that has taken place in quality, he states that during the past year he has relieved from a main track on tangents rails that weighed 75 lb. to the yard which had been in the track only five years; whereas, in the same district, and under precisely the same traffic conditions, there still remain in the track 60 lb. rails that have been in service for over fifteen years, which it was not considered necessary to renew this season. While this may be an exceptional case, he considers the steel rail which was furnished by the manufacturers fifteen to twenty years ago about 50 per cent. better than the rail now manufactured. This is not intended to apply to special high class rails, which may be furnished by a few rolling mills under superior specifications, but to the ordinary rail supplied to and purchased by the majority of railroads.

Nut Culture.

There is much encouragement to plant our native nuts and some of the foreign ones. As a rule, our indigenous trees are good bearers, and in Mr. Van Deman's opinion they produce nuts of better quality than foreign ones. The chestnut is receiving the most attention now, and there are a few well-marked native varieties of value. Although they are smaller than the European varieties, they are of better quality and very productive. The best are Delaney, Excelsior, Griffin, Hathaway, Morrell and Otto. Rocky hillsides and other places unsuitable for tillage can be used with profit for nut trees, and they can be set about buildings and in pastures. The European varieties seem more profitable. It seems to be a rule that the more pubescence the nut has, the better its quality. European varieties are more fuzzy than the Japanese, and less so than the American sorts. The most prominent of these are the Paragon, Numbo, Ridgely and Hannum. Japanese chestnut trees have a more dwarf habit, and the nut has a bitter skin. They graft quite readily on American seedlings, and the best varieties introduced are Alpha, Early Reliance, Grand and Superb. Among the hickories, the best nut tree is the pecan, a native of our Southern States, and the shell bark hickory, common throughout the Northeastern States. A firm in Pennsylvania ships more than twenty tons of hickory nuts every year. The nuts should be planted in rough places four feet apart each way and thinned as they grow. Seedlings are variable, and so they must be grafted. The principal varieties are Hale's, a larged thin-shelled sort, Leaming, Curtis, Elliott and Mulford. Among the walnuts, our native butternuts may, perhaps, be improved, but the so-called English walnut is the best of the family, although it is difficult to grow as far north as New York. There is no doubt that nut trees are hard to graft and to bud. Evaporation should be prevented until the sap begins to flow. When the sap starts the grafts should be put in underground. The scions should be cut so as to have the pith all on one side, or, if necessary to graft above the ground, they should be covered well to prevent all evaporation possible.—Garden and Forest.

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Correspondence.

The Apprenticeship System.

To the Editor of the SCIENTIFIC AMERICAN:

We have read with interest your editorial "Decadence of the Apprenticeship System" in the SCIENTIFIC AMERICAN of May 23, 1896, and, noting your expression of regret that the old system is no longer generally in use, we have thought you would be pleased to learn that it is still common in machine shops and foundries in Providence, and to some extent in use in Philadelphia, Worcester and other mechanical centers.

In Providence apprentices serve from two to four years, and are taken by almost every important machine shop and foundry. In our own works there are 81 boys serving three years. In the drawing room there are 7, in the pattern shop 3, in the foundry 10, and in the machine shop 61. The terms on which we take apprentices are shown by the inclosed blank, copies of which we are pleased to send to any who are interested. [This contract blank was received and is alluded to editorially.—Ed.]

We pledge ourselves to give the boys thorough instruction, as you will note, and they are moved from place to place in the shops under a prescribed routine as they acquire a certain degree of skill; and we endeavor to give them some degree of responsibility, and do not allow them to be treated as mere helpers.

There is little or no direct profit to us in having them, but indirectly there is a very great advantage, for in no other way are we as sure of obtaining satisfactory workmen, and there is always a probability that among our apprentices are some whom we can train to fill important positions. A number of our assistant foremen and several of the foremen and heads of the manufacturing departments served their apprenticeship with us; and a great many of our former apprentices are foremen or superintendents of important establishments.

A great many of our boys, probably the majority, attend the night sessions of the Rhode Island School of Design and obtain a sufficient knowledge of mathematics and mechanical drawing. They thus, between the school and the shop, are able to have most of the advantages offered by trade schools, and without disparaging these schools, which in many places and in many industries are doing excellent work, we may say we think the greater skill is obtained under the system which gives the greater number of hours to actual shop practice, especially in the trade of a machinist.

One feature of the system, as it existed in former times, is certainly lost. The boys cannot now live in the home of the head of the establishment, and, when they are suffered to drift into cheap boarding houses, this is a distinct loss and injury. But in most cases it is possible to find motherly women who are glad to take the boys into their households, and the boys whose parents live in town are best off in their own homes.

We feel, therefore, that in its most important features the old apprentice system can be maintained under existing conditions in our line of business, and we believe manufacturers should be urged to continue it, and that every influence should be brought to bear upon parents and upon boys, as well as upon manufacturers, to place it first in importance, and not to have it considered as secondary or subordinate to a system of trade schools, however excellent they may be.

BROWN & SHARPE MANUFACTURING COMPANY.
Providence, R. I., June 23, 1896. Per Z. Chafee.

The Future of Chemistry.

Has chemical analysis, like other dogs, had its day? Or is chemistry about to enter upon a new phase? Analysis certainly does not tell us enough. Nearly, if not quite, all the prominent steel makers of the United States, for example, have made steel springs to the specifications of the Pennsylvania Railroad. These specifications require that the steel shall show a certain chemical analysis; and yet it is stated to be a fact that one certain maker who makes steel which conforms to the requirements, so far as chemical test can determine, yet not more closely than the other makers conform to it, gets in the open market a considerably higher price for his springs than any other maker. And the railroad company in question has demonstrated to its satisfaction that it can afford to pay this higher price because the springs, notwithstanding that chemical analysis shows them to be precisely identical with the others, give enough better results in service to more than justify the higher price. It is the same with fine irons.

Take Swedish iron as an example. It is well known that this iron possesses certain qualities not possessed by any other iron known; yet irons have been produced elsewhere which, so far as the most exhaustive chemical tests can show, are precisely identical with the Swedish iron. It seems, therefore, that a chemical test will not tell us all we must know about such matters. Where chemical analysis fails to show the difference between two specimens of steel or iron, the microscope as now used will show a very decided difference between them, and the difference thus shown seems to bear some relation, more or less exact, to the differences that are shown by the same specimens under physical tests. We are therefore likely to see a much larger use of the microscope in the future. Will metallurgical chemists, therefore, be at a discount?—Iron and Coal Trades Review.

Recent Patent and Trade Mark Decisions.

Office Specialty Manufacturing Company v. Cook & Cobb (U. S. C. C. N. Y., Wheeler, J.), 73 Fed. Rep., 684.

Paper Holder.—The Smith & Shannon patent, No. 217,909, has been held valid and infringed, following prior adjudications.

Expiration Because of Foreign Patent.—A U. S. patent terminates with a foreign patent on the same thing that was obtained not in the American patentee's name, nor that of his employers, but was obtained in connection with their interests. This clause of the statute is not confined to the inventor.

Compressor for Paper Files.—The Cleague patent, No. 312,086, has been held to have expired with the previous German patent.

Invention.—There is no patentable invention in extending every other letter of an alphabetical index outward from, instead of in front of, the one above, making two rows instead of one, whereby the total length of the sheets is reduced one-half.

Index for Paper Files.—The Shannon patent, No. 331,259, has been held void for lack of invention.

Miller v. Donovan (U. S. C. C. A., 2d Cir.), 73 Fed. Rep., 682.

Infringement of Patent for Road Cart.—The Miller patent, No. 371,090, is restricted as to its first two claims, by the prior state of the art, to combinations having longitudinal springs of the precise form shown; hence these claims are not infringed by a cart which does not have the two part spring described in the patent.

Limitations of Patents for Road Carts.—The Miller patent, No. 459,098, designed to give to the longitudinal springs an increased longitudinal motion, and its first two claims are, in view of the prior art, limited to the precise form of spring shown, for it was old theretofore to give play to the spring for running one or both ends through eyes or slot with rubber packing, washers, etc., to prevent rattling or too free play of the ends of the spring.

Jackson v. Vaughn (U. S. C. C. Cal., Morrow, J.), 73 Fed. Rep., 837.

Purchase from Territory Licensees to Sell in Forbidden Territory.—The owners of certain patents on horse hay forks granted a license to a firm in Ohio to exclusively manufacture and sell such hay forks within the territory of the United States lying east of the Rocky Mountains. The licensees agreed that they would not permit any of such hay forks made by them to be sold west of a line drawn north and south along the western margin of the Great Salt Lake Valley, and extending north and south therefrom to the boundary lines of the United States. The agent of the Deere Implement Company, of Illinois, who was located at San Francisco, ordered 100 horse hay forks covered by the patents referred to, of the Illinois company, which in turn bought them from the Ohio firm and then shipped them to San Francisco, where they were sold by the agent of the Illinois Company. The court held that the San Francisco agent was not liable for infringing the patent.

Right to Buy and Sell Patented Articles.—One who buys patented articles from one authorized to sell them at the place where they are sold, becomes possessed of an absolute property in such articles and can sell them at any time or place.

Bonsack Machine Company v. Elliott (U. S. C. C. A., 2d Cir.), 73 Fed. Rep., 834.

Infringement of a Patent for Cigarette Machines.—The Emery "belt" patent, No. 216,164, for a cigarette machine is limited, as to claims 10 and 12, to an endless belt curved transversely into tubular form to constitute a mould for compressing the tobacco into a filler, and such claims do not cover a flat belt that merely supports and carries the filler after it has been formed by some other device.

Bernheim v. Boehme (U. S. C. C. A., 3d Cir.), 73 Fed. Rep., 833.

Catches for Satchels.—The Lieb patent, No. 242,944, has been held void because of the prior Lagowitz spring catch.

Limitation of Patent for Catches for Satchels.—The Flocke patent, No. 303,716, if sustainable at all, must, in view of the Lagowitz spring catch, be limited to a catch having three cam projections placed equidistant on the shaft, and is not infringed by a catch having two such projections.

Fenton Metallic Manufacturing Company v. Chase (U. S. C. C. N. Y., Lacombe, J.), 73 Fed. Rep., 833.

Invention.—No invention is required to provide skeleton frame, roller-shelf book cases with "hand holes" or recesses to facilitate lifting the books from the shelves, because of the hand holes in the old-fashioned wooden shelves.

Prior Decision in Support of Preliminary Injunction.—A prior decision by the Supreme Court of the District of Columbia, granting an injunction in a case where the defendants had been bound by the result of a former interference proceeding in the Patent Office, is not sufficient to support a motion for a preliminary injunction against one who was a stranger to such interference proceeding.

Book Cases.—The Hoffman patent, No. 450,124, has been held void for lack of invention.

Consolidated Fastener Company v. Columbia Fastener Company (U. S. C. C. N. Y., Coxe, J.), 73 Fed. Rep., 828.

Jurisdiction of Corporations in Patent Cases.—A New York corporation whose certificate of incorporation provides that its principal business office is to be in the city of New York, but that its business is to be in the city of New York and such other places as the company may select, may be sued in the northern district of New York for an infringement committed there, where it had advertised that its place of business was at a certain town in that district and such was found to be the fact. It is doubtful whether a corporation can be sued in the southern district if the infringement of the patent was committed in the northern district, although its charter provides that its principal office is to be in New York City.

Preliminary Injunction.—Where there have been no court decisions sustaining a patent, if the court can see that there is a fair controversy on the two vital questions of patentability and infringement, the wiser course is to postpone their consideration until the final hearing, and without a preliminary injunction, although a bond might be required of the defendant.

Albany Steam Trap Company v. Worthington (U. S. C. C. N. Y., Townsend, J.), 73 Fed. Rep., 825.

Limitation of a Patent for Pump Regulating Valves.—The Blessing patent, No. 207,485, has been construed in connection with the disclaimer and held to be limited to the precise means described for automatically regulating a pump for returning to a steam boiler the water of condensation by means of a system that is not open to the atmosphere.

Northall v. Bernardin (Pat. Comm.), 75 O. G., 1853.

Reopening Interference Case by the Commissioner After Decision in Court of Appeals.—In this case, after the decision in the Court of Appeals, entirely new evidence was discovered in the nature of a fraudulent alteration prior to the suit of the date of a drawing exhibit which had been used in the case, but the commissioner refused to open the case and admit such evidence after the decision of the Court of Appeals, because of a doubt as to his authority to do so, and also because the petitioner has a remedy by a bill in equity in the United States courts, where such evidence could be introduced and the case properly heard and decided.

Ex Parte Briggs (Pat. Comm.), 75 O. G., 1854.

Appeal from Rejection of Claims.—In an appeal from the rejection of a claim to the examiners-in-chief the appellant must be prepared to show that the claim is allowable when viewed from every standpoint, and the action of the examiners-in-chief is not confined to the determination of the sufficiency or insufficiency of the reasons for the examiner in rejecting the claim.

Invention.—The use of a rack and pinion for raising and lowering a cutter head used in an ice planer involves no invention, in view of the previous use of such rack and pinion for adjusting a wood planer, as such planers are analogous devices.

Slow Crystallization of Amorphous Powders.

To a certain degree most metals will weld at temperatures considerably below their melting points, at which we, therefore, have to presume them to be in a semi-liquid state. Alloys are formed under similar circumstances, and Mr. Walthère Spring has shown that not even actual contact is required for this purpose. For instance, lumps of copper and of zinc, a slight distance apart from one another, united to brass. If we explain this observation, with Mr. Spring, by the plausible assumption of a volatilization of both constituents from the solid state, we really introduce another factor, and can dispense with the semi-liquid state, although the one phenomenon does not exclude the other. But we need not strain our imagination to conceive partial fusion. The molecules of solid bodies need not all vibrate with the same velocity at a certain average temperature. A complete uniformity of temperature does certainly not exist, and welding may be due to molecules which are substantially warmer than the bulk of the metal, while other particles may, at the same time, still be at a lower temperature. This explanation is independent of the chemical nature of the body, and should generally apply to bodies which can bear a certain heating without undergoing chemical decomposition. According to this view, a solid is not a finished mass incapable of changing its shape.—Engineering.

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BALLISTIC TEST OF REFORGED ARMOR PLATE FOR THE RUSSIA.

The continued progress made in the manufacture of armor in this country by the Carnegie Steel Company, Limited, is well illustrated by the engravings we present this week of the results of the ballistic test of the last Russian trial plate for the Russian armored cruiser Russia, tested at the naval proving ground at Indian Head, May 13, 1896.

The tough, hard armor manufactured by the Carnegie Company under the patent of W. S. Corey represents the latest development in the manufacture of American armor plate. The combination of the qualities of toughness and hardness is obtained as the result of special chemical composition, work, supercarbonization, reforging, and water hardening. The final operation is the actual face hardening (frequently called tempering), and it consists in the sudden application of a suitable cold liquid.

The plate in question was 16 feet long, 8 feet wide, and tapered from 8 to 4 inches in thickness; and was of nickel steel, face hardened and reforged. It was attached by bolts in the usual manner to a wood backing and was attacked in rapid succession by five 6 inch and three 4 inch Holtzer armor-piercing shell fired at high velocities, the 4 inch projectiles being fired only against the thinnest section of the plate.

The requirements of the test were that four 6 inch projectiles fired at striking velocities of 1,856 foot seconds, and four 4 inch shell at striking velocities of 1,926 foot seconds, should not get entirely through the plate and backing nor crack the plate sufficiently for any portion of it to leave the backing.

Owing to the very great irregularity of the Dupont brown powder employed, the velocity of the third shot was so much below that required that an additional 6 inch projectile was fired at the point marked No. 5, very near to impacts Nos. 1 and 2. But as the plate stood up so well under its repeated battering, the fourth 4 inch shot was waived.

The projectiles were fired in such quick succession that the stresses caused thereby must have seriously taxed the plate. This method of test would certainly discover any lack of uniformity in the plate, while its ability to keep out and completely pulverize a 6 inch Holtzer shell when fired at a striking velocity of 2,149 foot seconds showed what splendid ballistic resistance it possessed.

The proximity of the points of impact to the edges and corners of the plate and to each other; the number, rapidity of attack and high velocities of the projectiles; subjected the plate to such an unusual test that General Mertwago, the president of the Russian inspection commission in the United States, recommended that the remaining armor under manufacture by the Carnegie Company be accepted without further test, which recommendation the Russian government unhesitatingly granted.

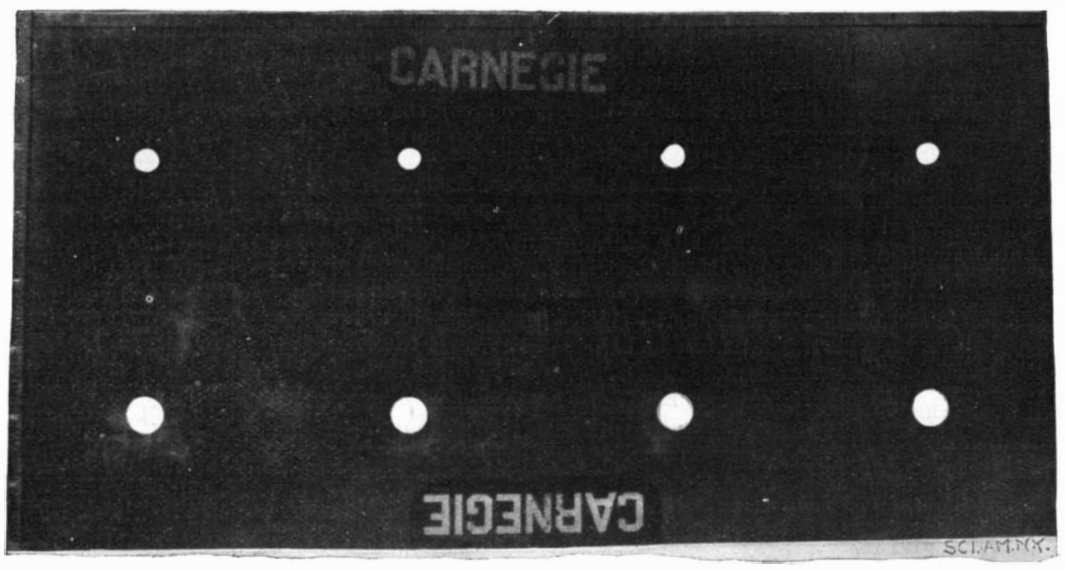
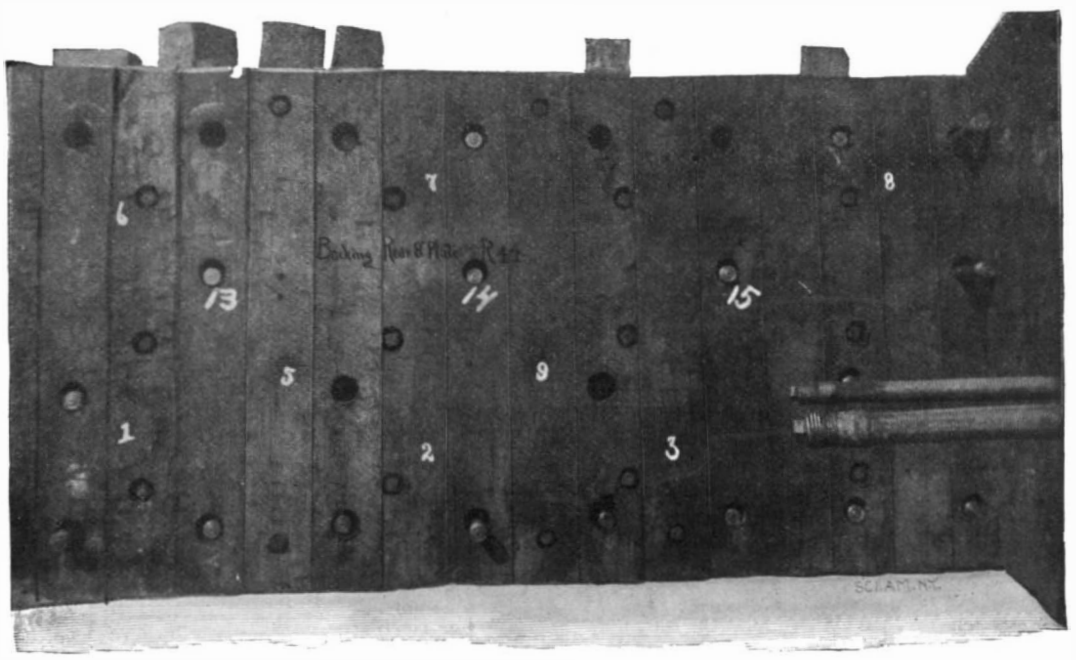
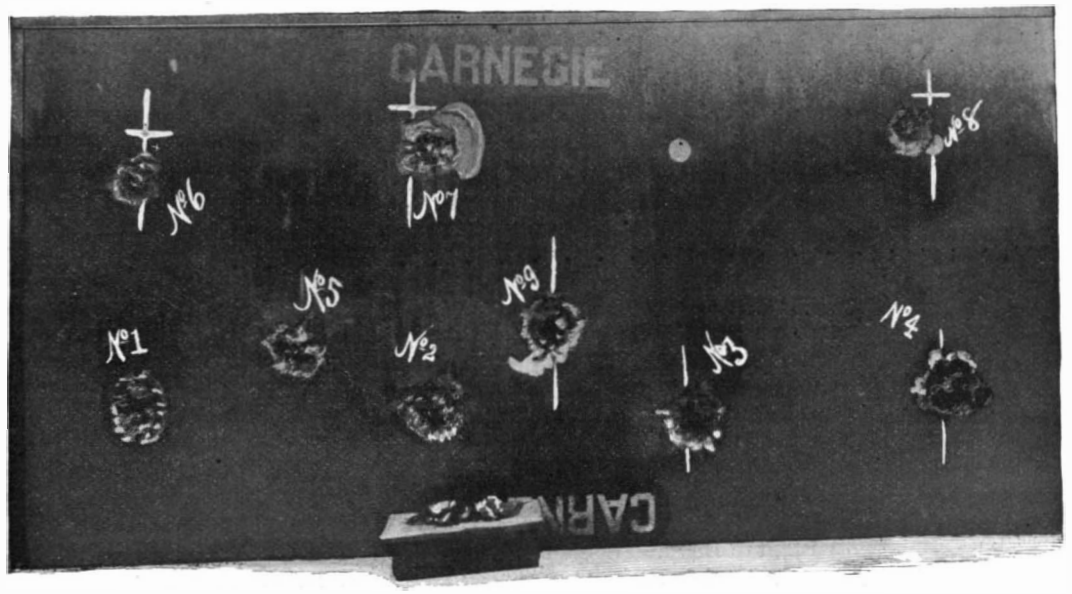


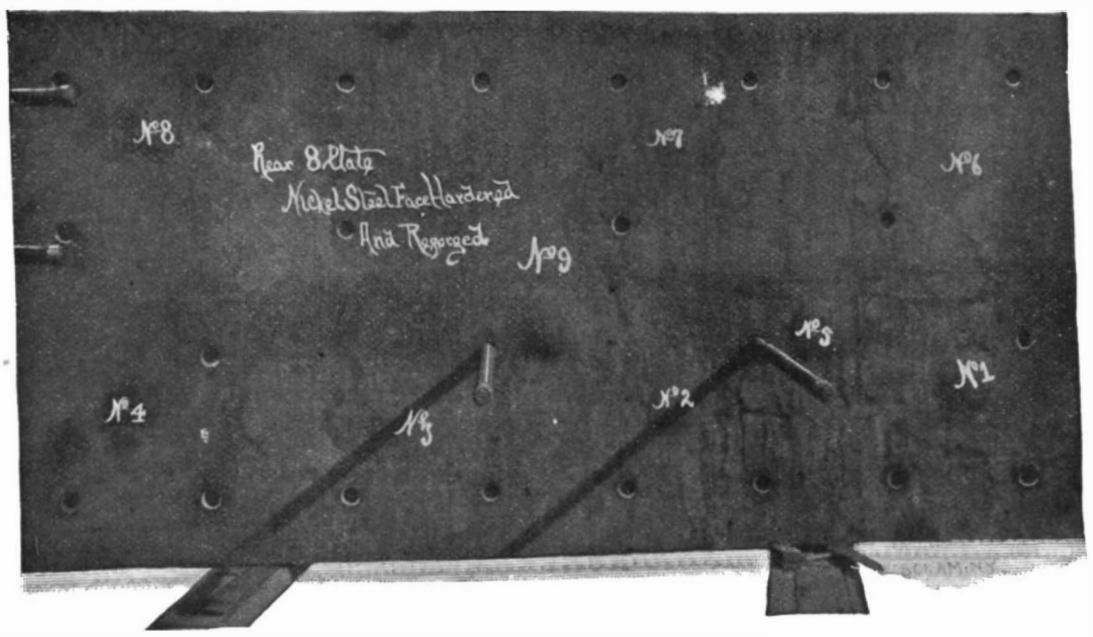
PLATE IN POSITION FOR TEST.



FRONT FACE OF BACKING AFTER TEST—PLATE REMOVED.



FRONT FACE OF PLATE AFTER TEST.



REAR FACE OF PLATE AFTER REMOVAL FROM BACKING.

BALLISTIC TEST OF NICKEL-STEEL, REFORGED ARMOR PLATE FOR THE RUSSIAN GOVERNMENT.

In fact there seems to be no doubt that the plate would have kept out any projectile of a caliber equal to the thickness of the plate at the point of impact if fired at service velocities. This certainly is an excellent protection for any ship. Both Russia and the Carnegie Company are to be congratulated.

The following table gives the details of the test:

Impact No.	Projectile, Holtzer, caliber inches.	Striking velocity, foot seconds.	Striking energy, foot tons	Estimated penetration, inches.	Condition of projectile.	Condition of plate.
1	6	1887	2484	5	Broke up.	No cr'ks.
2	6	1826	2311	5	"	"
3	6	1886	2480	5	"	"
4	6	1846	2362	6	"	"
5	6	1866	2413	6	"	"
6	4	1991	907	2	"	"
7	4	1958	877	2	"	"
8	4	1959	878	2	"	"
9*	6	2149	3221	7	"	"

* This round fired at the request of the Carnegie Company, the group of armor having been accepted after the eighth shot.

Water Pressure at Two Hundred Feet.

A crushed mass of iron now lying in a scrap yard at Pittsburg demonstrates the tremendous pressure of water at a great depth. It was constructed for a diving bell, and was intended for use in Lake Michigan. As originally constructed it was a cube about six feet square, tapering slightly at both ends. The material was phospor bronze, five-eighths of an inch thick. Each plate was cast with a flange, and they were bolted together, the bolts being placed as closely together as was consistent with strength. The side plates were further strengthened by ribs an inch thick and two inches wide, and the entire structure was strongly braced. The windows, intended to be used as outlooks by the divers inside, were three inches square, fortified with iron bars and set with glass plates one inch thick. The entire weight of the bell was 23,000 pounds. When completed it was sent to Milwaukee and towed out into the lake about twelve miles, where there was over two hundred feet of water, and was sent down for a test. The manufacturer of the bell was so confident of its strength that he wanted to go down in it on the test trip. It was well he did not. When it reached a depth of about two hundred feet, strong timbers which had been attached to it came to the surface in a splintered condition. Suspecting an accident, the bell was hauled up and found to be crushed into a shapeless mass. The inch thick plate glass bull's eyes were pulverized and the entire body of the bell forced inward until none of its original outlines remained. On a basis of two hundred feet depth, the pressure that crushed this seemingly invulnerable structure was 86·8 pounds per square inch, or 353,924 pounds to each side of six feet square. The total pressure, therefore, on the cube was 2,723,548 pounds, or 1,361·7 tons.—Indianapolis Journal.

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A GIGANTIC TURTLE.

There exists at present upon Mauritius Island a gigantic land turtle belonging to Mr. Antelme, who received it in May, 1895, from the Six Islands or Egmont Islands, located in the Indian Ocean to the northeast of Madagascar. Accurate data and some photographs sent from Mauritius, by Mr. Sumeire, to Mr. T. Sanzier, at Paris, permitted the latter gentleman to give a description of this extraordinary animal that was embodied in a note presented by Prof. A. Milne-Edwards to the Academy of Sciences at its session of September 9 last, and published in the Comptes Rendus. We reproduce two of the photographs in the accompanying engravings.

The first, in which the turtle is seen in profile, gives an idea of the length, in a straight line, of the animal's carapax, which reaches 4·33 feet. The view of the back, with a reproduction of a metric measure and of four men holding the animal, gives a perfect conception of the size, length and form of this gigantic reptile, whose weight is 528 pounds. The length of the carapax in following the curve is 5·35 feet. This turtle, according to all probabilities, belongs to the species described by Dumail and Bibron under the name of Testudo Daudinii. —L'Illustration.

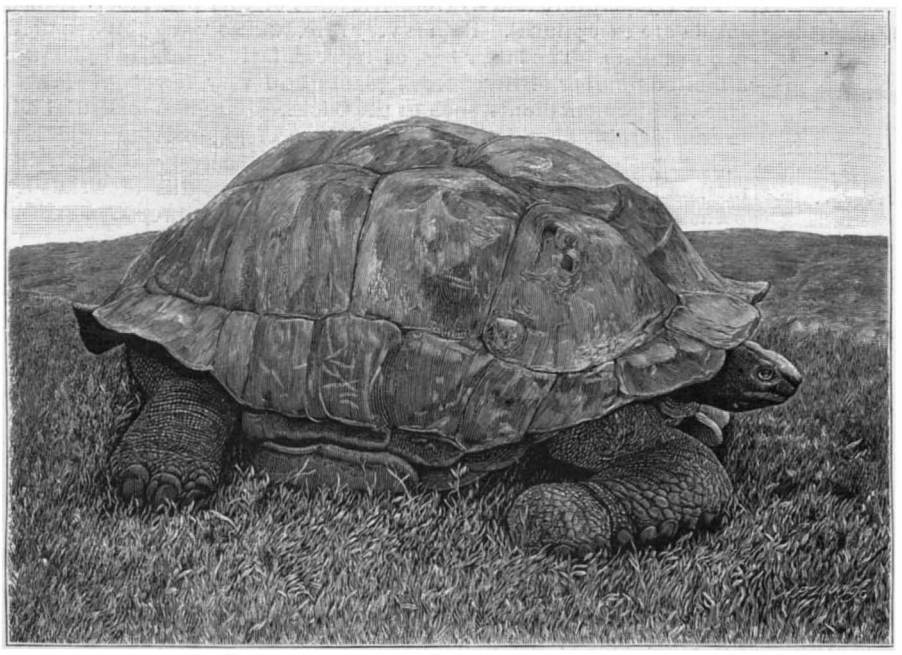

Fig. 1.—GIGANTIC TURTLE FOUND IN THE EGMONT ISLANDS—SIDE VIEW.

A Government Biological Survey.

BY JOHN ELFRETH WATKINS, JR., IN THE EVENING TELEGRAM.

Washington, June 16.—The Biological Survey will be the name of a brand new government institution to go into existence the first of next month. Mr. Morton, the Secretary of Agriculture, is to be its creator, and it will be conducted under the jurisdiction of his department. Just as the Geological Survey determines the mineral belts of the country, the new Biological Survey will determine its animal and vegetable belts.

The result is expected to be a tremendous economic advantage to our producers, declares the Washington Star. Our agriculturists, horticulturists, stock raisers and those engaged in any of the various animal or vegetable industries are, after a few years, to be given charts showing the exact portions of each State and Territory where certain animals and vegetables can be advantageously raised. These will be supplemented by a great catalogue containing every land animal and vegetable of the world, and indicating the areas in which they may be raised or cultivated by Americans.

Millions of dollars are thrown away each year by farmers and other producers, who plant seed in the wrong soil or climate, or who undertake to breed animals where the atmosphere and food resources are uncongenial. An efficient corps of naturalists will make a detailed survey of the whole country, counting and classifying the living species found in each county of each State and Territory. They will also note the conditions of climate, altitude and soil, and will note how far each condition influences the distribution of the species. No other country in the world has ever instituted a survey of this kind.

The chief of the new survey will be Dr. C. Hart Merriam, now chief of the division of ornithology and mammalogy in the Department of Agriculture. The field work will be performed by six naturalists to be distributed about the country and shifted from North to South, according to change of season. In a few weeks Dr. Merriam will start out upon a surveying tour in the far West. His equipment will consist of a light buckboard, with outriggers, to be drawn by mules. Upon the back of this will rest a large chest for containing specimens. The outriggers will hold the camp equipment and subsistence, which will include dry rations, to be eaten with such game as may be met on the way. The doctor will be accompanied by his first assistant, Mr. Vernon Bailey. Both will ride saddle horses, while a third man will drive the team and act as a packer.

This modest army of naturalists will wage bloody war against all animal life—not domesticated—met on the march. Before resting in camp each night they will set several hundred traps for catching nocturnal animals. As they proceed on the march by daylight they will rain showers of hot lead upon birds and beasts. For killing birds and small animals will be used shotguns with auxiliary barrels of from 0·22 to 0·32 caliber. These will fit inside the ordinary barrels, and will dispatch shot almost as fine as powder, so selected because it does not injure the specimens.

As each animal is trapped or shot it will be skinned and stuffed. Its skull will be saved and sealed in a glass bottle. Tags attached to each specimen will contain its name and the exact locality where it was found. Specimens of characteristic species collected in this manner throughout the country will be studied with reference to plotting the animal belts or zones. This work, which is of preliminary nature, is almost completed, characteristic species of almost every State having been collected by the division of ornithology and mammalogy.

Charts will be completed showing the belts occupied by each species, studied one at a time. The naturalists will have before them as many large topographical charts as the total number of species found. The zone of the mink, for instance, will be determined by taking each specimen of that species found in the field and making on a map a dot, showing the locality where each was killed. These dots will cluster, and the areas included in the clusters will be tinted in a representative color. The same process will be employed for plotting zones for each species of vegetable.

Besides indicating the sections of the country in which valuable animal and plant life can be raised with success, Dr. Merriam tells the writer that his survey will determine the zones in which injurious insects, animals and weeds abound, or are likely to migrate when certain species are introduced. This will further save our country, it is thought, many thousands of dollars. For instance, a farmer may want to plant potatoes on the side of a mountain. He will look at the biological map and first learn between what altitudes potatoes will flourish. He will next locate the potato bug zone. He will plant anywhere in the potato zone except that part intersected by the potato bug zone.

The same theory applied to other forms of life would hold good for level lands, all of which are included in one of the various zones. Minks, weasels, rats, mice, moles and other denizens of the field which prey upon produce will be located just as insects. In determining their zones, as well as those of weeds, it must be predicted whether they will prosper in new localities after the introduction of plants and animals upon which they depend for subsistence. Not only will persons living in affected zones be warned against raising certain things, but those adjacent will be advised to get rich by raising those things affected in the nearby injurious zones.

What foreign products are adapted to our zones? This, Dr. Merriam tells the writer, is the greatest of all economic problems to be solved by his survey. As soon as we know definitely where to put them, we can take any animal or plant species and find it a suitable climate. We have a sample here of practically every life-zone in the world. Foreign species introduced here in appropriate climates have, so far, seemed to prosper better than in their native climes. This, Dr. Merriam says, is for the reason that they get away from their natural enemies. The best example of this is the English sparrow.

By artificial selection, domestic animals can be adapted more widely to the different zones than wild ones, but there is a limit which frequently causes breeders of foreign species to lose many dollars. For instance, much money has been lost by American breeders who have striven to raise Jersey cattle in high zones where Holsteins will prosper, but where the former will perish.

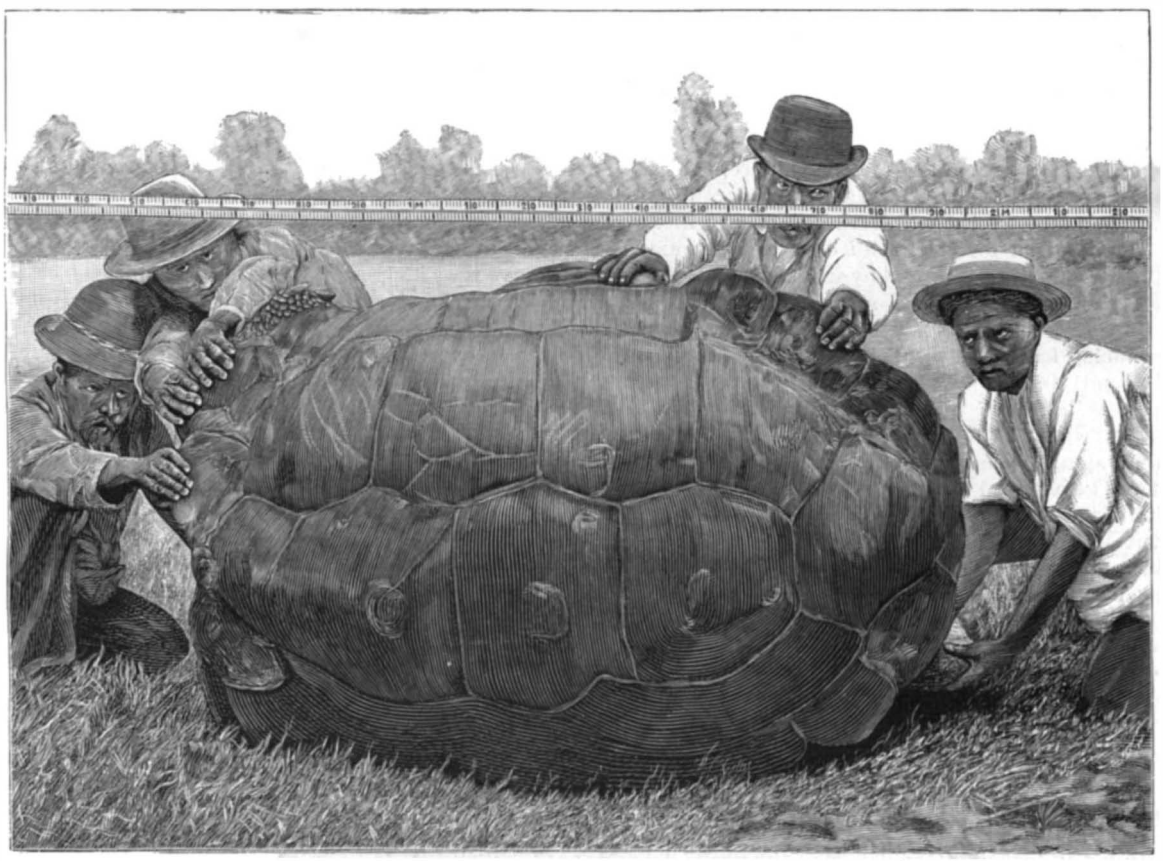

Fig. 2.—GIGANTIC TURTLE—DORSAL VIEW.

Suggestibility of Crowds.

The spontaneous phenomena which the Germans call Massenpsychosen—a word denoting a state of mind shared by a mass of people at once—are nothing more than Nature's experiments in suggestibility conducted on a large scale for our benefit. The panic is a familiar illustration. The terrifying suggestion which each man could easily brave alone becomes so intensified in being reflected upon him from a thousand frightened faces that he gives way and becomes for the time being an unreasoning struggling animal. During every great strike such phenomena are common. A crowd gathers, the spirit of disorder is abroad, and the soberest of citizens feels his fingers fairly itching for mischief. A stone is thrown, another, and then another, and in a few moments every man is vying with his neighbor to see how much damage he can do. In these cases the frequently repeated suggestions given by the words, and still more by the deeds, of others overcome the results of years of training in orderly habits, and when the excitement has subsided many a participant in the late riot may fall to wondering "what in the world possessed him." The colloquial phrase, like many another, enshrines a truth. He was indeed possessed—not by any evil spirit, to be sure, but by myriads of delicate physical impulses, which, streaming in through eye and ear, prompted him with almost irresistible force to violence.—Popular Science Monthly.

PROF. L. L. DYCHE, of the University of Kansas, has gone to Alaska with a view to Arctic exploration.

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Some Odd Inventions.

A very odd inventor was the famous Drummond, of Hawthornden; of such finished oddity, indeed, that he appears to have forgotten all about his wonderful notions after publishing them in the most conspicuous form possible. The tale has been diversely interpreted; we have room only for a mere hint of the facts. Drummond was a poet, of wide culture, of the most amiable disposition; well born and well to do; that is, a man whom one would not suspect of mechanical inclinations. Nor has any evidence been found to suggest that he had a secret leaning that way. But suddenly the realm of Scotland learned that this gentle scholar was prepared to turn out military engines of the most awful truculence in great variety. There could be no question of the fact, for his gracious Majesty Charles I announced it in a solemn proclamation, dated "Hampton Court, the last day but one of the month of September," 1626. In that document Drummond undertook to produce sixteen machines specified, and he had "not a few inventions besides." They all had long Greek names—a very characteristic touch—but he was good enough to translate them for the convenience of the vulgar. The descriptions are long also, which is a pity, for the quaint effect is lost in abbreviation.

First comes Baktrobrontephon, the Thundering Rod, "from the dreadfulness no less than the suddenness of its effect;" it appears to have been an improved carbine. Next, Lonkakontises, the Thrusting Pike—in the nature of a bayonet probably. Then Armakeraunos, the Thundering Chariot, vulgarly the Fiery Chariot, which we give up. Anoxibaliston, an open gun. Plastoskedastikon, vulgarly the Flat Scourer, for defending walls and ships. Probolekinetos, the elephant or cavalier errant, for attacking walls; a new kind of vessel called, "from its truly stupendous and terrible effect," Limenolotheutes, vulgarly Leviathan. After ten of these horrid marvels, we proceed to scientific invention; as the Anerometron for calculating the strength of winds; "a certain light kind of craft" which can sail against adverse breezes called Enaliodromos—the Sea Postilion, etc. The list ends with one "organic machine producing from a natural and never-wearied cause Perpetual Motion," which receives the name Aeikinetos, the Eternal Mover. Every line of the voluminous papers which Drummond left has been scanned again and again by admiring editors and biographers, and it can be asserted that no shadow of allusion to this extraordinary announcement can be found among them. But there it is, among the state papers, without possibility of error—"Our Faithful subject William Drummond, of Hawthornden," the hero is named.—London Standard.

Amount of Sleep Required.

"A healthy infant sleeps most of the time during the first few weeks," says the New York State Medical Journal, "and in the early years people are disposed to let children sleep as they will. But when six or seven years old, when school begins, this sensible policy comes to an end, and sleep is put off persistently through all the years up to manhood and womanhood. At the age of ten or eleven the child is allowed to sleep only eight or nine hours, when its parents should insist on its having what it absolutely needs, which is ten or eleven at least. Up to twenty a youth needs nine hours' sleep, and an adult should have eight. Insufficient sleep is one of the crying evils of the day. The want of proper rest and normal conditions of the nervous system, and especially the brain, produces a lamentable condition, deterioration in both body and mind, and exhaustion, excitability, and intellectual disorders are gradually taking the place of the love of work, general well-being, and the spirit of initiative."

THE VEGETATION OF LOWER CALIFORNIA.

Lower California is a peninsula that extends parallel with the North American continent from 32° to 22° north latitude, that is to say, a little beyond the Tropic of Cancer. It forms part of the Mexican States and its limits are: at the north, the Desert of Colorado; at the west, the Pacific Ocean; and at the east, the Gulf of California. Its width (from 20 to 25 leagues, on an average) is slight in proportion to its length (about 330 leagues).

The temperature and hygrometric state of this peninsula are exceptional. Rain is very rare, and so vegetation suffers. The latter has, as representatives, but a limited number of herbaceous plants and very few trees. Succulent plants, such as the Cactaceæ, are met in considerable abundance and sometimes of gigantic size. The order Fouquieraceæ, composed of some very interesting species, develops almost exclusively at this point of the globe. As for the yuccas, which dominate the series of arborescent species, they accommodate themselves perfectly to the conditions of excessive dryness of the country, and this has given them the name of desert palms. Finally, we also meet with two or three species of Prosopis, of the order of Leguminosæ, and a curious fig tree of which we shall speak further along.

It will be understood that in such a country the wealth of the soil lies in the metals that are extracted from its depths rather than in remunerative cultures. The flora of Lower California is therefore poor, and is not absolutely special to it, since it extends beyond the frontier into Arizona and the neighboring territory that the United States have taken away from Mexico, as well as along the Mexican coast situated on the other side of the Gulf of California. This flora, upon the whole, does not characterize Lower California solely, but is typical of this entire American region.

In order to protect themselves against a nearly constant evaporation, the plants of this country have had to take on strange forms, in diminishing the evaporating surfaces, which are usually the leaves. So the latter are rare or ephemeral. At all points where water is wanting, we meet only with dry and stony hills clothed with gnarled trees or leafless shrubs. Cactaceous plants alone relieve the dreary aspect of the country by their green color. But, when an abundant rain supervenes, nature, dead in appearance, is seen in a short time (two or three days only) to assume a new aspect. The vivifying element, so ardently awaited, gives these plants a holiday attire. A magnificent herbaceous vegetation soon covers the desolate and superheated earth, which was not even benefited by dew, which the stored-up heat checked. However, this fine state of things is of short duration. It may last several weeks, unless the action of the wind and the heat of the sun come to change the scene at short notice. Here is the whole explanation of the strange vegetation of Lower California. If, supposably, the humidity were prolonged, and the rains more frequent, we should find a tropical flora here in all its forms.

The fertility of the soil of this country is therefore unquestionable when water reaches it. We know, from evidence, that the missionaries in times gone by undertook farming here, which is still prosperous, although it is in inexperienced hands. These pioneer husbandmen impounded the rain water in the valleys by means of dams, so as to preserve it as long as possible for the benefit of their agricultural enterprises.

Although the foliaceous trees of these regions shed their leaves as soon as the dry season returns, the lax and soft tissues of their trunk, as well as the bark and pith, hold enough water in reserve to permit them to endure the persistent heat without perishing. The Fouquieraceæ (coach whip cactuses), represented by three or four species only, are, with the Cactaceæ, examples of this phenomenon.

That portion of the peninsula that faces the Pacific is more favored than the side that skirts the Gulf of California. The sea breezes coming from the west moisten the atmosphere of this coast without reaching the eastern one, and so the species of plants that are stunted at the east are much better developed upon the western coast. It is here that we meet with the torote and the lomboy—trees of medium size whose leaves and flowers disappear shortly after expanding. Yet their branches are often covered with a foliation slightly recalling the large sized lichens that cover the surface of the trees of our forests. These are Bromeliads of the genus Tillandsia, of which we shall speak again further along, and which live as epiphytes, pressed against each other and not meeting with the necessary conditions of humidity upon the opposite side of the mountain.

The torote belongs to the genus Bursera, some of the species of which are exploited in Mexico for the essential oil that is extracted from the trunk and branches of the tree. The name of linaloe has been given to these particular species ever since the conquest of America. The structure of their wood is very peculiar. Ligneous fibers are rare in it, and the element that prevails is ligneous parenchyma, that is to say, a tissue with a thin wall and not possessing the elongated form of fibers; and then come medullary rays of the same consistence, so that when it is desired to split this wood it resists and, owing to its elasticity, expels the wedges that one endeavors to drive into it. There is still another peculiarity to be pointed out. The essential oil of linaloe that is obtained through distillation does not exist in wood that is in a healthy state. In order that it may appear in the cells of the parenchyma, the wood must be in a state of necrosis, that is to say, dead. When a smallish branch has been broken (and the natives do not deprive themselves of the pleasure of mutilating these trees), the alteration that ensues extends from one place to another and the essential oil is seen by the brownish color that appears to gradually fill the cells of the wood. It is then that through distillation is obtained the essential oil of linaloe that is used in perfumery.

An endeavor was once made to utilize the bark of the torote, which contains a large proportion of tannin (from 10 to 12 per cent), but the exploitation of it was abandoned on account of the cost of transporting the bark.

The lomboy is less interesting. It is an arborescent Euphorbiad of the genus Jatropha, with soft wood, and which sheds its leaves during the dry season, like the preceding. Nevertheless, its bark contains a red juice which makes an indelible stain, and which, perhaps, from a chemical view point, possesses properties of some value.

To return to the Bromeliads, of which it has been a question above, we should add that they are probably the only known examples of plants of their order that are used as forage. The species observed by one of us is the Tillandsia recurvata, vulgarly called tojin, which covers the branches of the above named trees, and which is eaten with avidity by animals, for want of other and more succulent plants, during droughts.

There is, however, another kind of forage that will surprise the reader quite as much to learn about, although it has its analogue in Algeria and in the regions in which grows the Barbary fig tree, that the dromedaries do not disdain. Under the name of visuaga are designated throughout Mexico the large cactals belonging to the genus Echinocactus, and which, with age, reach 6 and sometimes 10 feet in height, as stated by Dr. Weber. These plants have prominent longitudinal ribs and are provided with hook-shaped spines. The diameter of their trunk may reach 25 or 30 inches. When forage gives out, the inhabitants, by means of a special instrument called a machete, remove all the spines from the visuaga by excoriating, from top to bottom, the summit of the ribs that bear them. Then they cut the fleshy mass of these visuagas into slices in order to feed them to horses and cattle, which are very fond of them. Finally, the spines of these Echinocacti are used as fish hooks.

There are other cactals that are at least as curious and useful as the visuagas. Such are the pitahayas, a name applied to various species of the genus Cereus.

These plants are true fruit trees. In fact, many of them bear saccharine or acidulous fruits that are eaten raw or preserved, or that are dried like prunes, and the equivalents of which are the Barbary figs that are sold in the south. The pitahaya dulce, p. agria, p. barbona, etc., are of the number.

Finally, there are others still that bear the name of cardon (Fig. 2). These form trees that, when old, reach a height of 50 or 60 feet and a diameter of 25 or 30 inches at the base. Their candelabra form allows them to be distinguished at great distances. One of these species is referred to Cereus giganteus or to C. Pringlei, which is closely related to it.

It will be understood that such plants need a stiffening tissue. In the center of the trunk and branches there is a very thick pith which becomes destroyed with age, so that the plant forms a genuine tube, having the ligneous cylinder as sides. The wood of which it is formed, although not very strong, is quite homogeneous, and its cylindrical arrangement assures its solidity, so that cardons are used as building material and as fuel.

Many other species of the order Cactaceæ, but of small size and varied form, are found here. But these have merely a scientific interest.

The yuccas are the only trees that hold their leaves, and, as they are monocotyledons having more or less resemblance to palm trees, they are named in the United States and Mexico desert palms (and also Spanish bayonets, Adam's needles, etc.) These plants and the cardons are about the only arborescent ones met with in the Mohave desert of Sonora and in all the analogous districts of Lower California having sterile portions. These yuccas are called here datyl cimarron. They are more numerous and better developed upon the Pacific slope, and the specimen shown in Fig. 3 is certainly the largest example that is known. An endeavor has been made to utilize these plants by employing their leaves, which are rich in filaments, for the manufacture of paper pulp. In certain parts of Mexico, their root stock is used as soap, on account of the large proportion of saponine that it contains. In

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Lower California the interior of the trunk is used for the manufacture of mattresses. To this effect, the trunk is allowed to macerate for some time in water, and the interior is then extracted, beaten and exposed to the sun. There then remains a fibrous mass which, having been rendered supple, assumes almost the consistence of horse hair. The young trees are the ones most esteemed for this purpose, the old ones being too poor in elastic fibers.

The Ficus Palmeri merits notice as an interesting tree. It always grows upon the side of the basaltic cliffs of ravines, in thrusting its numerous adventive roots into the fissures of the rock in order to seek humidity therein. What is strange is that the branches, and especially the roots, are flattened, and not cylindrical. After the tree has grown old, the roots come into contact and become adherent, and then, reaching the rock, mould themselves thereon, just as a soft semifluid substance would, and exhibit a curious whitish aspect. Under proper conditions, this fig tree, which sheds its leaves only during exceptionally hot weather, yields edible fruits of the size of a walnut all the year round. The ancient Indians greatly esteemed these, and the possession of the zelate (the name they gave this tree) was often disputed among them with force.

In Lower California we find also a shrub that has somewhat the appearance of a young olive tree, with divaricate branches, and opposite leaves protected by a reinforced epidermis (one might say metallic leaves covered with a light felting). When Nuttall, who was for a long time justly regarded as the leading American botanist, took a specimen of this plant in hand, he at once saw that it must form a new genus. He therefore erected for it the genus Simmondsia, which took its place in a small family alongside of the box, that is to say, in the Buxaceæ, with the specific name Californica. When the season permits it, this shrub puts forth inconspicuous flowers that are soon followed by dry fruits having the aspect and size of acorns, the nucleus of which forms one of the food materials of the region. If, unfortunately, there has been insufficient humidity, the crop fails. It will be understood that in such a country, where the resources are so limited, this crop interests the inhabitants to the highest degree, and so, when it fails, they are very sorely tried.

We shall terminate this nomenclature of curious or useful plants with the cirio (Fig. 4), which may be justly regarded, like the Welwitschia of the west coast of Africa and the Didiera of Madagascar, as one of the strangest representatives of the vegetable kingdom.

It was observed for the first time in 1751 by the Jesuits who were traveling over the peninsula to establish missions there. It is spoken of by Father Clavigero in his Historia de la Baja o Antigua California. The description of it is given at some length by this writer, who had remarked the oddness of the plant. The cirio grows almost like a cactal, with the difference that it bears leaves like the other plants of which we have spoken. Some of these leaves are spiny and persistent, while others are normal and fall at the time of drought.

The stalk becomes inflated at an early age of the plant, but the branches that spring from this hypertrophied part are totally different and disappear in part, while they persist at the summit of the stalk. The latter, in time, rises like a column without ever dividing, unless it happens to get broken by accident, in which case it bifurcates. The lateral branches spoken of above cover the stalk to a greater or less degree, but the top branches, which are large, form a persistent crown and are the ones that produce the inflorescence. This latter assumes the form of a ramose panicle of a straw yellow color, bearing flowers that are destitute of brilliancy. The stalk is covered with a cortex—a sort of shining parchmented skin (rhytidoma) for resisting transpiration to as great a degree as possible. Beneath this is found a half inch layer of thick and almost osseous cells (sclerenchyma) forming a rampart against evaporation as well as a support for the cirio, which, as its name indicates, has the appearance of a taper (cierge). Deeper in the interior are found one or two rows of weak fibro-vascular bundles, and, finally, in the center there is a thick pith.

The soft nature of this plant, the trunk of which can be easily perforated by means of a saber, or a stiff blade, gave rise to the belief that it might be possible to turn it to some account. The International Company, which was organized for the exploitation of the land and the agricultural and other products of the northern part of Lower California, thought that it might be possible to manufacture paper pulp from the pith of the plant. A large quantity of it was unfortunately sacrificed, and the enterprise was then abandoned on account of the expense that the transportation of the raw material involved.

Fig. 1.—VISNAGA (ECHINOCACTUS PENINSULÆ).

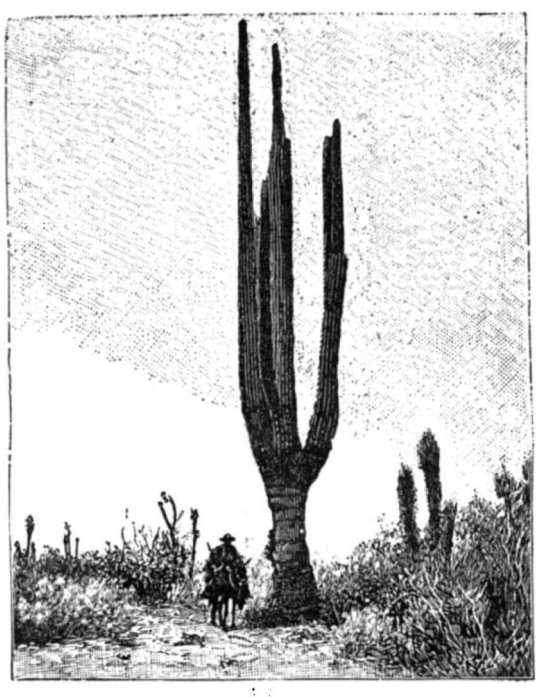

Fig. 2.—CARDON (CEREUS PRINGLEI).

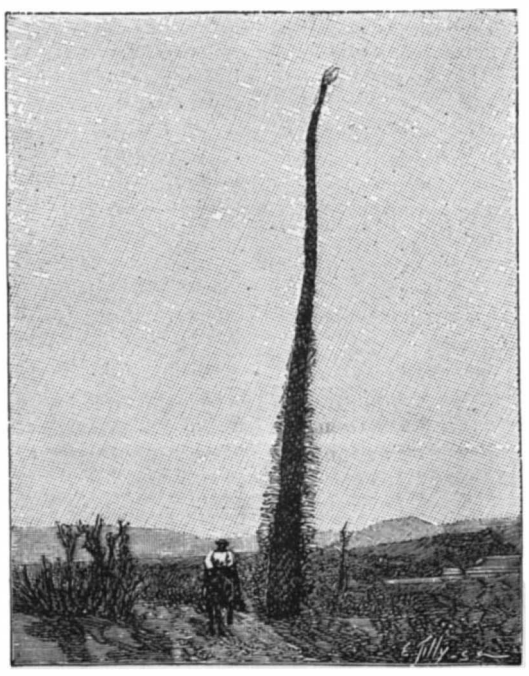

Fig. 4.—CIRIO (IDRIA COLUMNARIA).

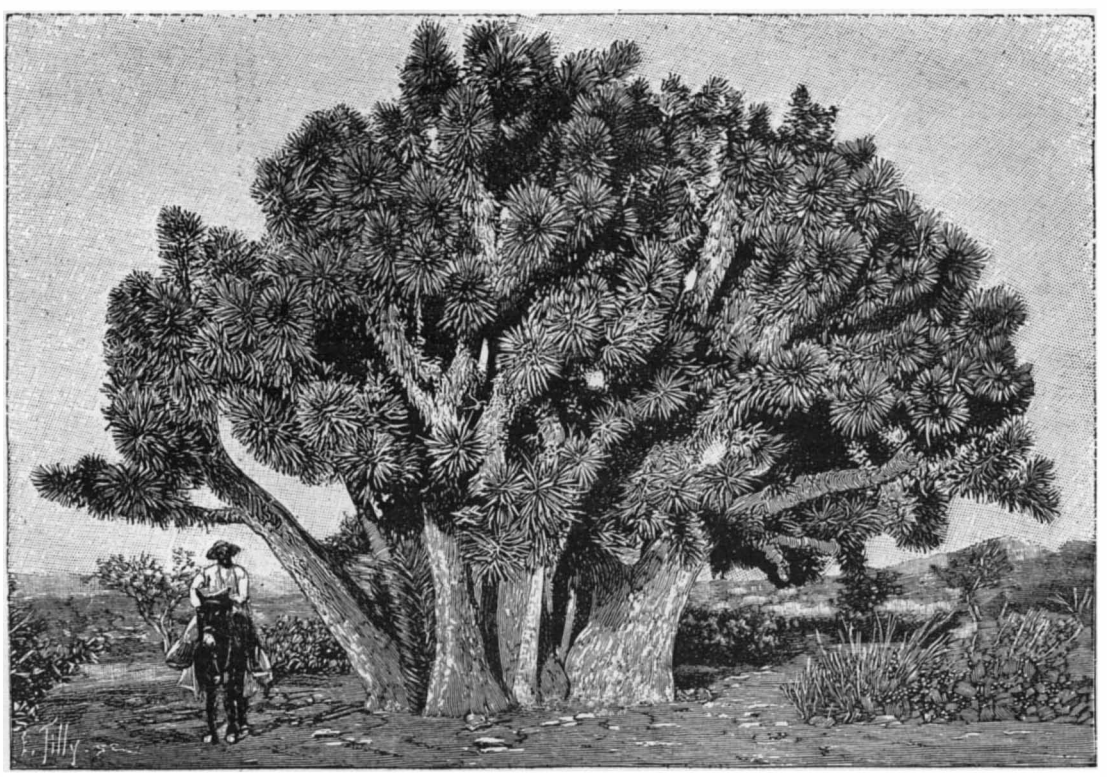

Fig. 3.—DATYL CIMARRON (YUCCA BREVIFOLIA?).

From a botanical view point, the cirio has a history that is worthy of being narrated. After the rush of people into Upper California at the time of the discovery of gold in this country, its development was rapid, and scientific establishments, among others, were created for the dissemination of as much information as possible in this new center. Voyages of exploration were undertaken to districts not well known, and, although the sterility of Lower California had been observed by the missionaries who traveled through it in the middle of the eighteenth century, scientists penetrated it and brought home interesting materials for study.

Along about 1859, Dr. J. A. Veatch, who was a conchologist, but who had some knowledge of botany, made collections of plants as well as of animals, and, among the former, obtained specimens of the cirio in flower. This species, as well as several others, was communicated to Dr. Kellog, a botanist, who, like Dr. Veatch, was a member of the California Academy of Natural Sciences. This new genus of the order Fouquieraceæ was published in the bulletin of the Academy in 1859 under the name of Idria, and the species was called columnaria. The small order to which the cirio belongs was up to then composed of but three species, all of which inhabited the same region. The Idria is a fourth representative and lives in company with two of them—the Fouquiera splendens and F. floribunda, which are widely distributed in this country. It is very curious to remark that four types of an order not as yet well known to botanists, and the place of which in classification has been much discussed, are quartered at this point of the globe—three species in Lower California, and a fourth, the Fouquiera spinosa, on the other side of the gulf, that is to say upon the Mexican coast.—L. Diguet and J. Poisson, in La Nature.

Butter in Plaster of Paris.

There seems to be no limit to the ingenuity bestowed upon the devising of means for accomplishing the transport of the perishable produce of distant climes to the English market. A new method, described in the Australasian, is that of packing butter in a box made of six sheets of ordinary glass, all the edges being covered over with gummed paper. The glass box is enveloped in a layer of plaster of Paris, a quarter of an inch thick, and this is covered with specially prepared paper. The plaster being a bad conductor of heat, the temperature inside the hermetically sealed receptacle remains constant, being unaffected by external changes. The cost of packing is about ½d. per lb. Butter packed in the way described at Melbourne has been sent across the sea to South Africa, and when the case was opened at Kimberley, 700 miles from Cape Town, the butter was found to be as sound as when it left the factory in Victoria. Cases are now made to hold as much as 2 cwt. of butter, and forty hands, mostly boys and girls, are occupied in making the glass receptacles and covering them with plaster. The top, or lid, however, is put on by a simple mechanical arrangement, and is removed by the purchaser equally easily. A saving of twenty-five per cent on freight and packing is claimed in comparison with the cost of frozen butter carried in the usual way.

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RECENTLY PATENTED INVENTIONS.

Mechanical.

SASH LOCK AND OPERATING DEVICE.—Abraham L. Schiller, Scranton, Pa. This invention relates to devices for raising and locking window sashes, and is particularly adapted to the single sash generally employed in vehicles, such, for instance, as cars, and the object is to provide such a device whereby the sash may be lowered by gravity to an open position and raised to a closing position by the simple arrangement of a drum and flexible connections between the drum and sash, and also wherein the window sash may be secured at any desired opening. It consists of a sash-raising device, comprising a rotary shaft, a drum movable longitudinally on said shaft, a clutch mechanism between the drum and shaft, whereby the said drum and shaft may rotate together, means for moving said clutch sections into engagement, means for separating the sections, and flexible connection between the drum and window sash.

PHOTOGRAPHIC WASHING TANK.—George R. Perkins, Schuyler, Neb. The object of the invention is to provide a new and improved portable washer for photographic negatives, arranged for properly washing the developed negative plates, and for permitting the same to dry after washing and without requiring a rehandling of the plates. The invention consists principally of a wash box having an overflow and an automatically opening outlet, said wash box being adapted to contain the negative plates to be washed, and a float valve for controlling the water supply to said box.

FIRE EXTINGUISHER NOZZLE.—John George Hagmann, La Crosse, Wis. This invention relates to nozzles for the discharge and spread of water in the case of fire, and it is designed to be secured to the outer side of a building or to the inner side thereof in any room or rooms, and it may also be adapted for use in connection with the nozzle of an ordinary fire hose. It consists of a nozzle for a fire extinguisher, substantially trough-shaped and having its bottom wall inclined from the ends downward to the central portion, and an inlet in the lower portion thereof, the said nozzle being arranged at an angle to the inlet, and having a drain through the lower portion of its front wall.

WRENCH.—Joseph Shafer, San Bernardino, Cal. The object of the invention is to construct a wrench especially adapted for removing nuts from vehicle axles in such manner that the nut need not at that time be grasped by the hand, thus preventing the fingers of the hand from becoming soiled. Another object of the invention is to provide a wrench through the medium of which a nut may be quickly and conveniently removed from or placed upon the vehicle axle, and whereby the wrench will be capable of starting the nut, no matter how fast it may be secured, and to screw the same securely to a bearing. A further object of the invention is to provide a wrench whereby, after the nut has been loosened, it may be expeditiously and conveniently removed from the axle, or wherever it may be placed, without swinging or moving the body of the handle of the wrench. The invention consists in the combination of a handle having a longitudinally slotted head and a projection adjacent thereto, a bolt extending through said slot and capable of sliding and turning therein, a casing made in the shape of an open polygonal box whereby it is adaped to engage a nut, said casing being secured to the bolt one side of the handle, a locking wheel secured to the bolt on the opposite side of the handle and adapted to engage the lug thereon, and means for turning the casing and the wheel.

STEAM DISTRIBUTOR FOR GAS GENERATORS.—Joseph H. Baker, Brooklyn, N. Y. The object of the invention is to provide for a uniform and even distribution of the steam to the fore of such furnaces and to cause the steam to be supplied to the maximum of fire service and in a dry state, thereby greatly increasing the hydrogen production of the gas generating furnace over that obtained by the steam jet usually employed to promote combustion. In brief, the invention consists of a steam distributor for gas generating furnaces, the same consisting of a body portion having an enlarged and open lower end and having an opening in its side and at its upper portion, a deflecting plate, a bolt connected to the upper portion of the body portion and holding the deflecting plate below the open lower end of said body portion, and a series of spacing pins, said pins being connected to the deflecting plate and extending upwardly therefrom, the pins having notches in their upper ends, the notches receiving the lower edges of the body portion.

SLEIGH KNEE.—Franklin D. Smith, Fremont, Mich. This invention relates to certain improvements in sleigh knees, such as are employed for connecting the runners detachably to the beams of sleighs, and the object of the invention is to provide a device of this character of a simple and inexpensive construction, which shall be adapted when in use to hold the runners securely in place, but capable of ready and convenient removal, so that the sleigh may be compactly stored away and packed up during the summer and for shipping. The invention consists in a sleigh knee composed of two sections, one of which is secured to the runner and is provided with a socket to receive the correspondingly formed portion or journal on the other section, which is secured to the sleigh beam, and a locking device to hold said sections together and permit them to oscillate and be readily detached.

MICROMETER CALIPERS.—Samuel H. Markham, Pittsburg, Pa. This invention consists of a micrometer gage comprising a frame having a tubular shank, a jaw movable in said shank, a sleeve movable rotatively and longitudinally on the shank and operatively connected to said movable jaw, graduations formed around one end of the sleeve, and a series of eight graduations, each extending longitudinally of the shank and adapted to be traversed by the graduations on the end of the sleeve, said series of eight graduations occupying a part of the surface of the shank corresponding to the space occupied by seven graduations on the sleeve.

Electrical.

ELECTRIC BATTERY ELEMENT.—George J. Ortner, Pueblo, Col. The invention relates particularly to zinc elements for a battery, and the object is to so construct the element that there will be practically no waste of the zinc; and further, to so construct the element that several may be packed closely together for transportation. It consists of a zinc element for a battery, comprising a hub portion having a tapered opening, an amalgamated zinc supporting stem having a tapered portion at its lower end, having a length substantially equal to the length of the opening in the element hub and having a straight cylindrical portion above the tapered portion of a diameter equal to the smaller end of the opening through the hub.

Miscellaneous.

SCISSORS SHARPENER.—Warren Titus, of Kelley's Island, O. The invention is in the nature of a simple and practical device for rapidly sharpening scissors or shears, producing a smooth, true, and fine edge with any degree of bevel to said edge. The invention consists of a sharpener for scissors and shears comprising an abrasive surface, laterally yielding guides for the scissor blade, and a yielding presser foot bearing upon the back edge of the blade.

UNDERWAIST.—George D. McKay, Minneapolis, Minn. The object of the invention is to provide an improved underwaist for boys, but applicable also for the use of girls and ladies, which shall permit a perfect freedom of action for the child at the waist line in romping and playing, allowing free use of the body in bending forward, backward, or sidewise without straining the buttonholes, tearing the clothing, or twisting off the buttons, and which shall also support the hose in an elastic manner. The novelty of the invention consists as an improved article of manufacture of an underwaist provided with a drawers supporting belt arranged entirely below the lower edge of the body of the waist, whereby to avoid the bulk resulting from an overlapping of said edge and belt, the latter being provided with fastening devices for securing the drawers, the body of the waist being provided along its lower edge from end to end thereof with a series of depending elastic straps connecting said body of the waist with the belt.

SASH FASTENER.—Thomas E. Epting, of Jennings, South Carolina. The invention relates to that form of sash holder in which double locking pawls are arranged between the sash and the stationary window casing; one of which pawls locks the sash against upward movement and the other of which locks the sash against downward movement; and it consists in the peculiar construction and arrangement of the parts for rendering the device universally applicable. In brief, it consists of a sash holder and lock comprising a box or casing, two spring seated pawls fulcrumed near the ends of the box and having their inner ends converging and protruding through the side of the box near its middle, and having push buttons on their other ends protruding through the outer side of the box near its ends, and a series of headed pins or screws seated in the sliding window sash at right angles to the same and co-operating with the pawls.

DISPLAY RACK.—Clarence L. Willits, Galva, Ill. This invention has for its object to provide a display rack, which will be particularly adapted for the purpose of displaying neckties, and one which may be readily adjusted to adapt itself to the amount of articles to be displayed to show them, and to this end the invention consists in a device comprising two longitudinal base bars having peculiar features of construction, and having standards rising vertically therefrom. These standards are arranged in transverse pairs and carry devices for supporting the neckties or other articles displayed, and by reason of the peculiar features of construction which the standards and said supporting devices have, the invention is particularly advantageous.

PUZZLE.—Walter E. Wilcox, Arkansas City, Kan. The object of the invention is to provide a puzzle in which a teeter bar is employed, together with three rolling objects, preferably marbles, the teeter bar being provided with sundry openings, the puzzle consisting in so distributing the rolling objects or marbles on the teeter bar as to balance the same. The rolling objects or marbles are adapted to represent the proverbial "Three Blind Mice," and are to be guided to proper positions on the teeter bar.

BANK FIXTURE.—Ishmael Jay Barnes, Decatur, Ia. The object of the invention is to provide a new and improved bank fixture which is simple and durable in construction and arranged to enable the cashier or other official to protect himself and the money in his charge against burglars and thieves during business hours. It consists of a bank fixture, comprising a series of slats journaled in an open frame, a bar connected with the said slats to open and close the same, a spring pressing on the said bar, a locking device engaging the said bar and adapted to normally hold the same in position when the slats are open, and a drop door provided with a catch adapted to engage a shoulder on the said bar, to support the door in an uppermost position when the slats are open, and a drop door provided with a catch adapted to engage a shoulder on the said bar to support the door in an uppermost position and to permit the door to drop when the bar slides to close the slats.

CLOTHES DRIER.—Sebastian T. Hollister, Brooklyn, N. Y. This invention relates to certain improvements in clothes driers, and has for its object to provide a device of this character of a simple and inexpensive nature, which shall be especially adapted for use indoors for drying clothes and for other household purposes. It consists of a clothes drier, comprising a sheet metal band having its ends provided with reciprocal fastening devices, and having pockets formed in it and arranged in pairs, the pockets of each pair being aligned with each other transversely of the band, and a hook or spring wire having its ends arranged adjacent and bent in opposite directions, said bent ends of each hook being provided with shanks arranged to engage the pockets of one pair and being held therein by the elasticity of the body of the hook, the combined length of the shanks of each hook being greater than the distance between the adjacent ends of the pockets which they engage.

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(6886) E. L. J. says: Will you please give me a formula for staining the inside of a camera dull black? A. A good dead black is made as follows: Mix drop black, ground in turps, with gold size and turps—enough gold size to keep the black from rubbing off when dry.

(6887) F. H. E. asks if a permanent magnet is affected by heat. If so, where or at what temperature does the action commence? Is the temperature produced by steam under 100 pounds pressure sufficient to demagnetize a permanent magnet? A. A magnet is demagnetized by a heat bordering on red. The heat mentioned will not injure it.

(6888) A. K. says: Would you kindly inform me as to how to make and what different articles to use to make impression wax? A. Temper paraffin wax with olive oil to suit conditions. Mix a little whiting with it while hot.

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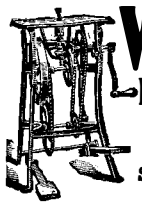

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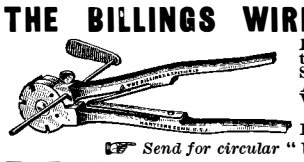

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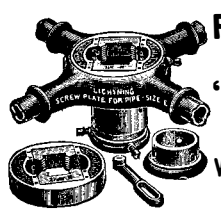

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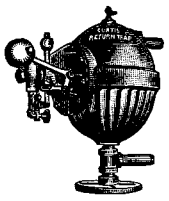

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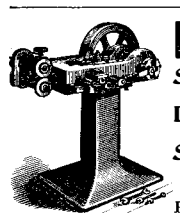

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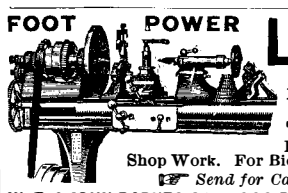

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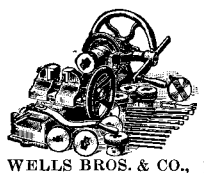

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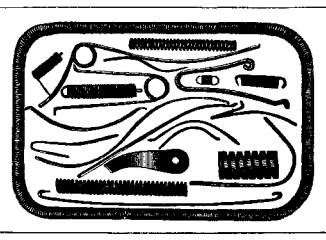

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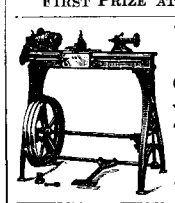

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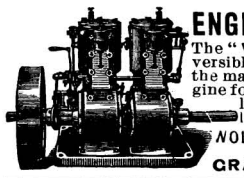

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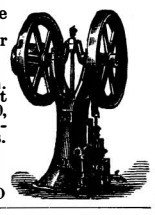

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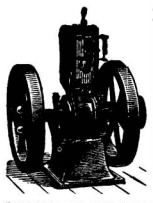

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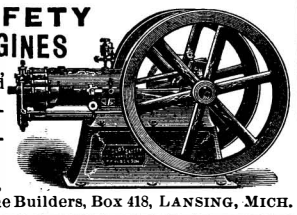

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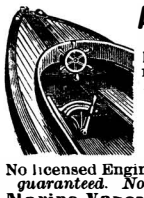

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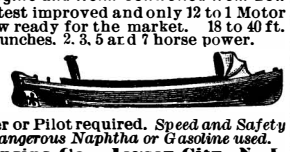

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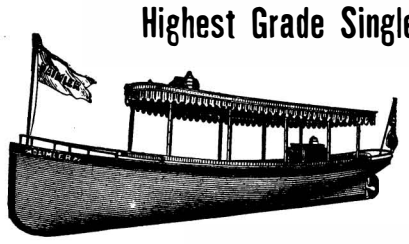

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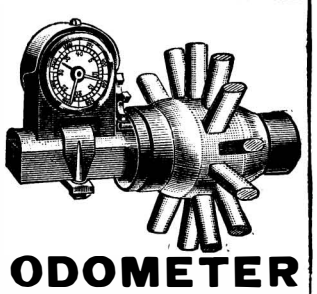

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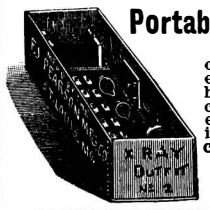

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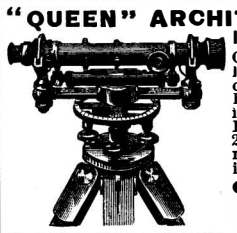

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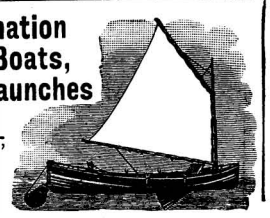

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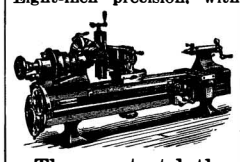

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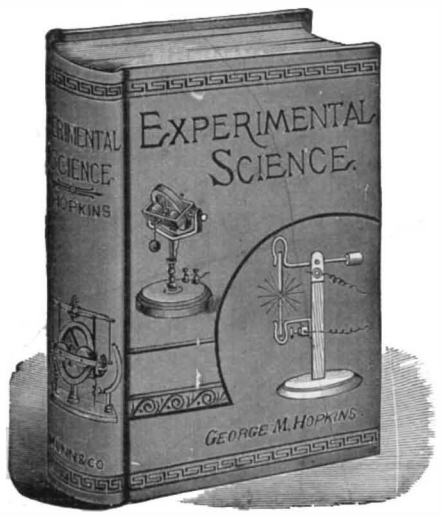

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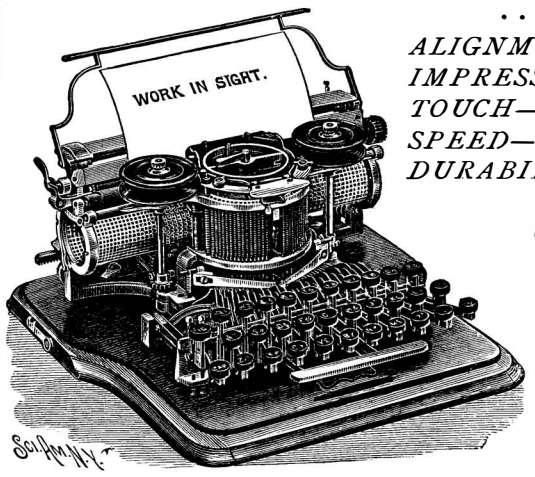

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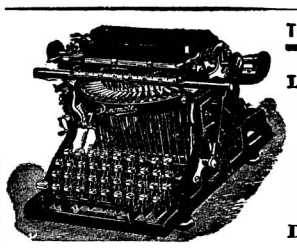

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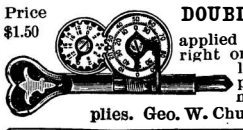

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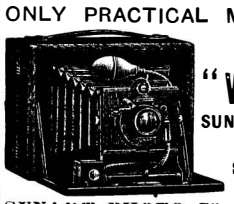

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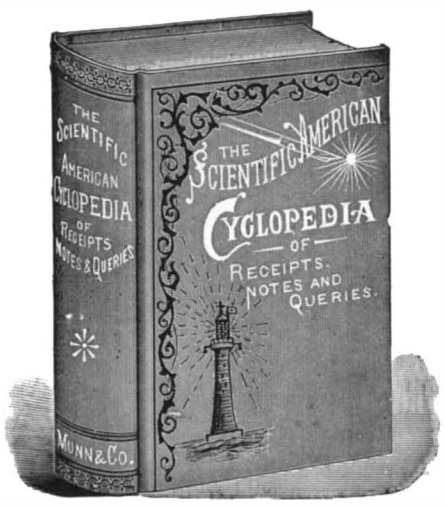

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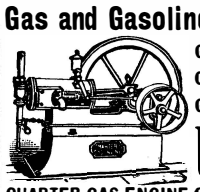

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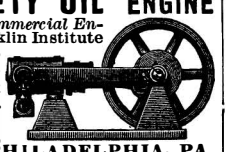

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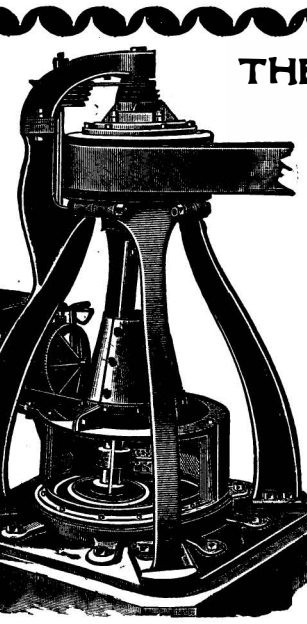

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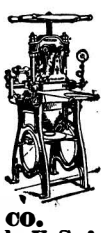

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